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EXPERIMENT STATION RECORD

VOL. 63 JULY, 1930 No. 1

The list of serial journals published by the U. S. Department of Agriculture has recently been augmented by the appearance of the *Extension Service Review.* This periodical is to be the official organ of the Extension Service and will be issued monthly throughout the year. It is planned to reflect within its columns all phases of extension activity, and it will serve as a direct and systematic medium of professional communication for the nearly 6,000 trained men and women scattered all over this country.

The need of a publication of this type has been felt for many years. As is brought out in an introductory statement by Director C. W. Warburton, in 1915 a recommendation was submitted by Dr. C. B. Smith, then in charge of extension work in the Northern and Western States, for "a systematic extension publication that shall represent the entire service and meet a need that is now felt by this office and all the extension force of both the Department and the colleges with which we come in contact in the field." Although nothing tangible developed from the recommendation immediately, it is of interest to note that many of the ideas then outlined as to the form and scope of such a publication are to be incorporated in the journal as now projected.

In the past recourse has been had mainly to mimeographed material dealing with such specialized phases of the work as the boys' and girls' 4-H clubs, the county agricultural and home economics agents, and the groups interested in home management, horticulture, plant pathology, animal husbandry, and forestry. These mimeographed publications will now be superseded by the *Review*, which will aim to cover the entire field and will embody representative material from the various lines of activity. In the words of its editor, "it will publish from time to time pertinent articles concerning extension work contributed by outstanding leaders. It will carry stories of accomplishment in all the fields it serves, and will outline methods of procedure that have proved to be valuable in extension teaching."

A distinctive feature of the new publication will be an editorial page, in which will be reflected the policies and opinions of the

Extension Service. The initial number discusses in this way two important questions, some considerations governing the use of contests in extension work and the opportunity for service presented to extension workers by the Agricultural Marketing Act. The second of these questions is further elaborated by an article in the same issue from the pen of Mr. Alexander Legge, chairman of the Federal Farm Board. As the editorial points out, "the Fedesal Farm Board believes the extension worker to be ideally situated and equipped to tell the story of organized marketing to the farmer and to gain his support for the cooperative movement." And it rightly concludes, "this belief on the part of the board is a challenge to the ability and reputation of the extension worker."

The number also contains numerous other brief articles, some of which are primarily informational while others raise questions for consideration or discuss very frankly some of the more urgent problems. Among the writers is Dean H. W. Mumford of Illinois, who contributes an article entitled Extension Problems Needing Consideration. In this article he maintains that important as has been the wider discussion of farm facts among farm people, the great accomplishment of Smith-Lever extension work has been "the development of rural leadership which has come incidentally in the attempt to disseminate facts." The greatest need of the extension service he believes to be "a better-trained staff, which spends as much time in finding out what needs to be done as it does in attempting to get others to believe that they should do it."

"I believe," he goes on to say, "that the next 10 years of extension work will be more exacting than the last 10 years. I believe that we should be more concerned in doing thoroughly well what we are doing than that we should try to reach the last man. I believe that we shall need to give more attention to the proper balancing of our programs, that we shall need to begin at once to develop methods that will stimulate, rather than stifle, individual thinking among the mass of farmers, for most certainly the farmer should look forward to the time when he can think through the most of his problems himself rather than feel impelled to call upon an expert to answer most of his questions."

The need for additional training is stressed in a statement by Dr. Smith entitled Necessity for Professional Improvement. Pointing out that a total of around 27 per cent of all county agents have had only limited or no college training, he finds in this circumstance an explanation of the restricted assistance still being rendered in the field of agricultural economics. "Our reports show," he declares, "that, notwithstanding the desire of farmers during many years for help in the field of agricultural economics, we have been giving them on the whole an average of but 4 per cent of the time of county agents and specialists, covering more particularly farm management, marketing, and rural credit as specific projects. . . . A few of the States—not more than can be numbered on the fingers of both hands—are doing magnificent work in some phases of the field of agricultural economics. At least 50 per cent of our States, however, are engaged only haltingly in this field."

The difficulty, in his opinion, goes back to the colleges of agriculture. "Most of the colleges have failed to give the county agents adequate training to make the agents feel sufficient confidence in themselves to advise the farmer in the economics field. The county agent has been put out in the county and told to make good. He has emphasized in his work the things he was taught and knew best. These have been largely in the field of production. He has succeeded so well in this field that . . . the real problem now with many commodities is to restrain rather than to accelerate production. With production in some degree met, the time has come to give more attention to economics if we are to serve the farmer and the public in the most effective way."

The way suggested to meet this problem is through the aid of economics extension specialists, through short courses held at the colleges from time to time for entension forces, and through granting to the county agents some form of sabbatical leave. "It would seem that the colleges that failed to give these agents a working knowledge in agricultural economics when they were students at the college are under strong obligation to be liberal in helping them to obtain additional training now that the agents have become representatives of the college in the counties and are being solicited for help by farmers in connection with all phases of agricultural economics. If we are to build up a strong extension force that meets expectations in these times of agricultural efficiency of the farmers, a force that has knowledge and courage and whose counsel is sound; if we are to build up morale and satisfaction in the force, we must provide a way for its growth. Extension agents will gladly do the economic work when they have the economic knowledge. Let us help them to the limit in their effort for further professional training in this field or in any other field in which training is needed."

The discussion of such problems has hitherto been mainly restricted to the annual gatherings of extension workers at the convention of the Association of Land-Grant Colleges and Universities, at which the rank and file of extension workers have been for the most part only indirectly represented, or to regional or subject matter conferences of more or less specialized nature. The establishment of the *Extension Service Review* now makes possible their presentation and discussion before a much more comprehensive audience than ever before. This should be of distinct advantage, for many of these problems are, of course, even broader than the interests of extension workers as a whole, and their solution in some cases involves the earnest cooperation of those whose immediate interest is resident instruction, research, or other fields of endeavor. While the *Review* is obviously intended and doubtlessly will be conducted primarily for its immediate extension constituency, much of its material should prove of even wider interest and appeal. The establishment of this new organ is, therefore, a matter of general interest to all friends of agricultural education and research, and its development should be followed with correspondingly sympathetic cooperation and appreciation.

The announcement late in 1929 of the establishment of the Capper Award for Distinguished Service to American Agriculture has very naturally led to more or less discussion as to the relative value of different forms of agricultural service, including that of research, and as to the practical possibilities of arriving at an equitable decision of such a question. Such discussion can seldom be conclusive, but it may none the less be useful. Among other advantages it may lead to a better appreciation on the part of the general public of many forms of such service which are now imperfectly understood or, it may be, merely taken for granted.

The Capper Award, it will be recalled, has been established by Senator Arthur Capper, of Kansas, with the objective of providing "a concrete expression of gratitude to some of the people who make contributions of national importance to American agriculture and to assist in stimulating public appreciation of unusually fine service to our basic industry." It is to be offered annually to a living American who has rendered distinguished service to the agriculture of the United States, and will consist of a gold medal and $5,000 in cash. No time limitation is imposed as to when the service rendered to agriculture was performed. The first award will be presented in 1930, and no person who has once received it will again be eligible.

The initial committee of awards is headed by President F. D. Farrell of the Kansas State Agricultural College. The remainder of the committee consists of Mr. John H. Finley, editor of *The New York Times;* President Carl R. Gray of the Union Pacific Railway System; Director James T. Jardine of the Oregon Experiment Station; Ex-Governor Frank O. Lowden of Illinois; President H. A. Morgan of the University of Tennessee; and Dr. W. T. Swingle, plant physiologist and agricultural explorer in the U. S. Department of Agriculture. As would be expected, this committee represents a variety of agricultural contacts and geographical areas.

It is evident that a real responsibility will rest upon the committee, especially in its early years, and that it also has a unique opportunity.

There will be widespread interest in its findings and not improbably some divergency of views. Since its formation, however, the present committee has sought suggestions from a large number of qualified persons interested in the progress of rural life, with the view to obtaining a representative body of opinion, and it will doubtless have the benefit of many helpful nominations. It will be of interest to observe the range and relative strength of such sentiment as it develops from time to time.

Entirely without reference to its bearing upon the fortunes of any individual at present eligible, it may not be inappropriate to indulge in some speculation as to whom an honor of this type might well have been awarded in the past. Starting with the establishment of the Republic, the first recipient would surely have been George Washington, by common consent acknowledged to have been the foremost farmer of his day, and whose pregnant words, "with reference either to individual or national welfare, agriculture is of primary importance," have appropriately been inscribed on the new administration building of the U. S. Department of Agriculture, to the establishment of which as a Federal agency he was the first to give responsible official indorsement. Associated with him would probably have been Thomas Jefferson and Benjamin Franklin, whose active interest in, and extensive contributions to, the betterment of the agriculture of their day have never received their full measure of appreciation.

Recognition must also have been given, though perhaps tardily, to the notable group of inventors headed by Eli Whitney with his cotton gin and Cyrus McCormick with his reaper. Another fertile field for candidates would have been the farm journalists, some of whose influence was restricted in area but whose efforts from the days of Luther Tucker and Orange Judd to those of W. D. Hoard and Collingwood have been a powerful factor in our agricultural history.

For the last half century the list would be greatly broadened to include a notable group of administrators and educators, the Federal commissioners and Secretaries of Agriculture, State commissioners, college presidents, and the like. Fro the ranks of statesmen would come at least the name of Senator Morrill, although so slowly did the cause of agricultural education win its way that the precise year of his admission might have been delayed long after the passage of the act of 1863.

Less prominently before the public, but backed by vital and substantial achievement would have been the pioneers in research—Johnson, Hilgard, and others. Not only the intrinsic value of their discoveries but the power of their example in establishing sound standards of research, developing institutions, and training competent successors to carry on their work would attest the importance and worthiness of their claims to consideration.

Obviously a committee of award would have had great difficulty in passing judgment on the relative service to agriculture of an Atwater or a Knapp, a Colman or a Goessmann, a Henry Wallace or a Wilson. The intangible values are too numerous and too profound for an accurate and immutable evaluation. Yet the attempt may be well worth while. Not every worthy man may receive recognition, but it is not unreasonable to expect that all who are so honored will be really worthy. It is doubtless true that no candidate of any standing will ever be appreciably influenced by the prospects of such a reward, but rather that all will go on in the words of Kipling, "each for the joy of the working and each in his separate star," but the way has none the less been opened for an annual appraisement of actual accomplishments in the varied fields of agricultural service, and the bestowal of a sustantial honor on the one—be he research worker, educator, editor, statesman, inventor, or what not—whose service to agriculture is deemed most outstanding.

By a curious coincidence, on the day the foregoing lines were written announcement was made that the initial award, which had not been generally expected for some months, had been bestowed upon Dr. S. M. Babcock of Wisconsin. It need scarcely be said that this decision recognizes the claims and ideals of research to an exceptional degree, and that the honor will be widely applauded as highly appropriate and richly deserved.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The chemistry of the colloidal state, J. C. WARE (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. XIV+313, pl. 1, figs. 96*).—"The purpose of this text is to present the fundamentals of colloid chemistry as they are disclosed by an analysis of the material available at this time and not in accordance with the facts of 20 years ago when the subject was on the threshold of a period of very intensive scientific research. The theoretical portions involve the most generally accepted interpretations of modern colloid chemists. The subject matter is presented with numerous journal references so that the student will be encouraged to do further reading and research. In presenting the standard theorems and equations, the analytical method is followed in order that the various viewpoints of the topic can be gained, as well as in order to encourage the student to reason out the relationships for himself."

The chapter headings follow: The units of a colloidal solution; sedimentation; interfacial phenomena (nonelectrical); turbidity and colloidal suspensions; colloidal suspensions and color; motion in colloidal suspensions; the electrical character of interfacial phenomena; the preparation of substances in the colloidal state; the precipitation of substances in the colloidal state and stabilization or protection of the colloidal state; water in combination and viscosity and plasticity of colloidal suspensions; emulsions; gels; silica gel and its use in adsorption; and catalysis by contact agents.

Handbook of chemical microscopy, I, É. M. CHAMOT and C. W. MASON (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, vol. 1, pp. XIII+474, figs. 162*).—"The present handbook of chemical microscopy is an attempt to present in logical and concise form the principles and methods involved in practical microscopy. To keep the book within suitable bounds, a rather comprehensive bibliography is incorporated. . . . Much of the material here compiled and discussed for the first time in book form is of paramount importance to all microscopists whether they are workers in the biological or in the physical sciences. This book may therefore as well be called a handbook of applied microscopy. Volume 1 has been confined to a discussion of optical principles of instruments, manipulative methods of general application, and the observation of physical and physico-chemical phenomena. Copious references have been given to journal articles or books wherein can be found detailed directions for specific microscopical methods." The contents follow:

Introduction; the optical system of the microscope; microscopes for use in chemical laboratories; illumination of transparent objects and light sources; illumination of opaque objects and metallographic microscopes; laboratory equipment and methods for the preparation of materials for microscopical study; special methods for interpretation of appearances and observation of physical properties; ultramicroscopy; photomicrography and microprojection; the study of doubly refracting materials by means of the polarizing microscope; chemical crystallography and preparation of crystals for study; determination of refractive indexes of liquids and solids; microscopic measurements and particle-size determinations; and quantitative analyses of heterogeneous mixtures.

Lecithin and allied substances: The lipins, H. and I. S. Maclean (*London and New York: Longmans, Green & Co., 1927, 2 ed., pp. VII+220*).—Since the appearance of the first edition (E. S. R., 39, p. 202) of this monograph, "no fundamental advances have been made in our knowledge of the chemistry of the lipins"; but it is noted that "the detailed structure of lecithin and kephalin has, however, been further worked out." In this, and in some other connections, minor changes have been made to bring the monograph up to date.

The alleged relation of carotin to vitamin A, W. Dulière, R. A. Morton, and J. C. Drummond (*Jour. Soc. Chem. Indus., 48 (1929), No. 42, pp. 316T–321T, figs. 3*).—In this investigation of the identity of carotin with vitamin A, the carotin was prepared from carrots by drying the amount of material as rapidly as possible in a vacuum oven at 50° C., extracting the dried powder repeatedly with light petroleum ether, concentrating the extract in a current of nitrogen, and purifying the crude carotin crystallizing from this extract on evaporation by repeated recrystallization from hexane. With each crystallization the melting point rose. On the fourth and succeeding crystallizations the melting point changed from being rather indefinite to sharply definite at a temperature of from 184.5 to 185°, this being much higher than the highest figure given in the literature for carotin. The material at this point was no longer very soluble in hexane and was of a much more intense color.

In the biological vitamin A tests of the various fractions, the curative method was employed, the carotin being administered in solutions of ethyl oleate, after cessation of growth. Contrary to the results reported by Euler et al. and by Moore (E. S. R., 61, p. 793) and by Collison et al. (E. S. R., 62, p. 206), small amounts of the carotin (0.01 to 0.003 mg.) were without effect. With very large doses, 0.5 mg., there was a slight stimulation of growth. These results point to the probability that the preparations of carotin employed by those who obtained growth were contaminated with an active substance.

The absorption spectrum of highly purified carotin, melting point 185°, did not differ qualitatively from the less pure specimens nor from values hitherto reported in the literature. The antimony trichloride test also showed no qualitative differences between the highly purified specimen and the carotin used by Euler. The absorption band of a concentrated sheep liver extract about 150 times as rich in vitamin A as the best cod-liver oil was at about $615\mu\mu$, while that of the most highly purified carotin was at $590\mu\mu$. The authors conclude that the most plausible explanation of the discrepancy between their results and those of the investigators who claim growth-promoting action with carotin is contamination with a trace of an extremely potent growth-promoting factor resembling vitamin A. It is noted, however, that the identity of the vitamin A in vegetable matter with that present in liver oils has never been satisfactorily demonstrated, thus implying the possibility of a plurality of vitamin A.

Some observations on the antimony trichloride colour test for vitamin A, N. Evers (*Quart. Jour. Pharm. and Pharmacol., 2 (1929), No. 2, pp. 227–237, figs. 6*).—Experience in the use of the antimony trichloride color test for vitamin A is reported, with various recommendations. In the opinion of the author, the antimony trichloride should be recrystallized from anhydrous chloroform and dissolved in the same solvent, and the solution should not be more than a month old when used. Since the quantity of oil taken for the test was found to have a marked effect on the results obtained, particularly with highly active fats, it was recommended that an inactive oil such as peanut oil should be added in such amounts that the total concentration of the oil in the reaction mixture would be about 2 per cent. The ordinary conditions for the test are summarized as follows:

"Two cc. of oil are pipetted into a tube or flask and the volume made up to 10 cc. with dry chloroform. Two-tenths cc. of this solution is pipetted into a test tube. Two cc. of antimony trichloride reagent are added, with thorough mixing, a stop watch being started when the last drop of reagent is added. The mixture is quickly transfered to a 1 cm. cell and the reading of the color is taken at 30 seconds. The number of blue units multiplied by 85 gives units per gram of vitamin A. If the color reading is less than 4 or more than 6 blue units, the test is repeated, using a larger or smaller quantity of oil accordingly, so that the reading lies between 4 and 6 blue units, and the result is multiplied by the necessary factor to give unit per gram."

The permanence of vitamin A in cod-liver oil as shown by the colour test, N. Evers (*Quart. Jour. Pharm. and Pharmacol., 2 (1929), No. 4, pp. 556–565*).—Using the antimony trichloride color test under the conditions noted above, the author has determined the vitamin A content of cod-liver oils stored for varying periods of time under ordinary conditions and under ab normal conditions of light and oxidation.

Samples of Norwegian cod-liver oils bottled from 17 to 26 years previously and kept in the dark until January, 1927, and then on a laboratory shelf not exposed to sunlight, gave results varying from 1.4 to 8.2 blue units, the highest figure corresponding favorably with that of the richest Norwegian oils of the present time. The oils giving the lower values were pale green and the higher amber.

Samples of a Norwegian oil and a North Sea oil stored for definite periods under varying conditions of light and oxidation showed the greatest loss in vitamin A on exposure to sunlight. Both light and oxidation tended to destroy the activity, but light to a much greater extent than oxidation. The addition of 0.05 per cent of hydroquinone did not prevent the action of light. It is considered that cod-liver oil is best preserved in amber bottles, with as little exposure to air as possible.

Variations in the results obtained by different observers with the antimony trichloride colour test for cod-liver oil, N. Evers (*Quart. Jour. Pharm. and Pharmacol., 2 (1929), No. 4, pp. 566–569*).—Data are reported on the results of the antimony trichloride test of two specimens of cod-liver oil, one of high and one of low vitamin A content, as determined (1) by several observers in the same laboratory, using the same technic and apparatus, and (2) by several observers in different laboratories using their own technic. The results obtained in the former comparison were very uniform, while those obtained in different laboratories with slightly different technic differed widely. It is emphasized that "if a standard for this test is to be included in the new British Pharmacopoeia, a carefully defined method must be laid down and allowance must be made for individual variations which always occur in a color test of this kind."

Observations on the concentration of vitamin B$_1$, B. C. Guha and J. C. Drummond (*Biochem. Jour., 23 (1929), No. 5, pp. 880–897, figs. 4*).—This paper records the results of attempts covering a period of 2½ years to concentrate vitamin B$_1$ (F). Both rats and pigeons were used in testing the various concentrates. In the rat tests, young rats averaging 50 gm. in weight were fed a basal diet consisting of rice starch 75, commercial casein 21, and salt mixture 4 per cent, each rat receiving in addition 1 drop of cod-liver oil of proved potency and 1 cc. of a 50 per cent solution of marmite autoclaved for 3 hours at 14 to 15 lbs. pressure in an alkaline medium. These supplements were fed separately, and after the growth curves were flat or falling, the preparations to be tested for B_1 were also fed separately. The standard of growth adopted was a weekly gain in weight of from 10 to 12 gm. for a period of 4 weeks. In a few instances the curative properties of the preparation were also tested by subcutaneous injections into rats with beriberi convulsions.

In the curative pigeon tests, the technic of Kinnersley, Peters, and Reader (E. S. R., 59, p. 294) was followed except that polished rice was used as the basal diet. The pigeons were kept in a warm room to guard against heat cures. Under the conditions of the experiment from 50 to 60 per cent of the pigeons showed the classical symptoms, most of them within 30 days. The materials to be tested were injected within 5 hours after the condition had been noticed, and the tests were considered positive only when the cures lasted for from 3 to 13 days.

Preliminary tests of various materials which have been claimed from time to time to possess antineuritic or growth-promoting properties, including yeast nucleic acid, nicotinic acid, and betaine, gave negative results, as was also the case with the volatile bases liberated from marmite by boiling with 20 per cent sodium hydroxide.

In attempts to isolate vitamin B_1, wheat embryo was first extracted for 3 or 4 hours at a temperature between 60 and 70° C. with 50 per cent alcohol containing a very small quantity of hydrochloric acid, filtered under pressure, and concentrated in vacuo to a yellow viscous mass. This material produced good growth in rats in doses containing 77.2 mg. solids, of which 73.5 mg. were organic and equivalent to 0.5 gm. of embryo. This extract was used as the starting material for two different processes of fractionation. The various steps in the first process were precipitation with inactive material by neutral lead acetate, adsorption on charcoal at various H-ion concentrations, precipitation of the active material from extracts of the adsorbate at pH 4 and 5 with phosphotungstic acid in saturated solution in 5 per cent H_2SO_4, adsorption of the hydrochloric acid solution of the active material from the phosphotungstic acid precipitation with freshly precipitated silver oxide, and fractionation of the acid alcohol extract of the silver oxide adsorbate with treatment of certain of the alcoholic extracts with an absolute alcohol solution of picrolonic acid in slight excess which removed the inactive material, leaving the active in the filtrates. The final filtrate was active in doses equivalent to from 4.5 to 6 gm. of embryo and carrying from 0.4 to 0.5 mg. of organic material. The average day dose in the pigeon curative tests was 0.043 mg. Attempts at further concentration were unsuccessful.

The second method of fractionation corresponded closely with that followed by Jansen and Donath in their fractionation of rice polishings (E. S. R., 57, p. 489). The active fraction finally obtained after the platinic chloride treatment in this method had an activity of 0.005 mg. expressed in pigeon curative day doses and promoted good growth in rats in daily doses of 0.015 mg. as the source of vitamin B_1. Attempts at further concentration by gold chloride yielded results suggesting that vitamin B_1 is made up of more than one factor. On testing the insoluble and soluble fractions separately, the insoluble fraction produced subnormal growth in rats while the soluble fraction was entirely inactive. A combination of the soluble and insoluble fractions, however, gave much better growth than the insoluble one alone. Confirmatory results were obtained with pigeons.

Tests of the stability of vitamin B_1 concentrates at varying H-ion concentrations gave results in general accord with those of Sherman and Burton (E. S. R., 56, p. 803), indicating that the inactivation is roughly proportional to the concentration of OH-ions. The observations of Peters (E. S. R., 52, p. 462) and of Levene (E. S. R., 60, p. 690) that nitrous acid has no effect on the antineuritic potency were confirmed. The pure concentrates had no bios effect.

The active picrolonic filtrate gave a strong Pauly reaction, as did the platinum fraction in the preparation obtained from the gold precipitate, while the gold filtrate gave a very faint one. Heated with 40 per cent NaOH, the picrolonic filtrate fraction gave an odor suggestive of alkylamines, but no evidence of scatole or indole. No sulfur reaction with lead acetate was obtained and the Millon xanthoproteic and purine reactions were negative, thus excluding the possibility of the vitamin being a hydroxyphenyl or purine derivative.

In discussing these findings, the authors emphasize the fact that there was no fixed ratio between the rat and the pigeon doses of the various concentrates tested; that the behavior of vitamin B_1, as judged by the results obtained in the two methods of fractionation reported, appears to be determined by the presence of other substances and the previous treatment of a given preparation; and that the activity of preparations of vitamin B_1 is probably attributable to more than one factor.

The hydroxylation of double bonds, S. Swann, jr. (*Ill. Univ., Engin. Expt. Sta. Bul. 204 (1930), pp. 16*).—It is noted that no commercially important synthesis of glycerol has yet been developed, and "from the experiments performed it is concluded that glycerine can be made readily from the allyl alcohol-ethyl alcohol mixture found in the oxidation products of petroleum, so that the method should be useful in this case if the industrial drawbacks are taken care of."

Persulfuric acid was used as hydroxylating agent, and, as it was found that the oxidant is effective in dilute aqueous solution, "persulfuric acid may now be used to hydroxylate substances which are either attacked or decomposed by concentrated sulfuric acid," the solvent heretofore in general use for persulfuric acid oxidations.

For the commercial preparation of synthetic glycerol persulfuric acid has the advantage of preparation from cheap materials (sulfuric acid or sulfates); but it is none the less considered that the industrial application of the synthesis would require a cheap effective regeneration of the oxidant from its reduction products.

Quinizarinsulfonic acid as a precipitating reagent [trans. title], W. Zimmermann (*Hoppe-Seyler's Ztschr. Physiol. Chem., 188 (1930), No. 3–5, pp. 180–188*).—This acid, 1, 4-dihydroxyanthraquinone-2-sulfonic acid, was found to form salts very difficultly soluble in water with the following compounds: Histidine, arginine, guanidine, methylguanidine, lysine, creatinine, monomethylamine, carnosine, anserine, trigonelline, homobetaine, betaine, tyrosine, phenylalanine, tryptophane, histamine ammonia, tetramethylammoniumhydroxide, agmatine, brucine, morphine, and nicotine. The monoamino acids other than those included above formed salts with quinizarinsulfonic acid readily soluble in water but precipitable by alcohol. Choline was also among the compounds precipitable from the last-named solvent.

The reagent itself was prepared by condensing hydroquinone (20 gm.) with phthalic anhydride (80 gm.) in the presence of water (40 cc.) and sulfuric acid (200 cc.) by three hours' heating at 170 to 180° C. and 1 hour at 190 to 200°, followed by the pouring out of the hot reaction mixture into 1,600 cc. of water and the recrystallization of the precipitated quinizarin from xylol, and sulfonation of the dry quinizarin with fuming sulfuric acid (20 per cent anhydride) at 130 to 150°.

Experimental trials of the reagent as a precipitant for organic bases are given in some detail.

On the determination of copper in organic substances [trans. title], E. CHERBULIEZ and S. ANSBACHER (*Helvetica Chim. Acta, 13 (1930), No. 2, pp. 187–194*).—In outline, the method consists in the destruction of the organic matter in the usual way, precipitation of the copper as sulfide from sulfuric acid solution, re-solution of the precipitate in nitric acid, and titration with a solution of nitroso-chromotropic acid, the 2-nitroso derivative produced by the action of nitrous acid upon 1, 8-dihydroxynaphthalene-3, 6-disulfonic acid. The reagent was found stable in alcohol-aqueous solution.

The nitroso derivative forms a lake of an intense violet color with the copper ion and, the reagent itself being of a yellow-brown color, a slight excess causes a color change from violet to brown. This permits, according to the results here described, the titration of the copper ion in concentrations of the order of 50 micrograms with an accuracy of the order of 0.5 microgram. The manipulation is given in detail.

Ordinary distilled water was found to contain too much copper for use in so sensitive a procedure, and distillation in glass apparatus proved necessary. Other reagents also required purification by distillation, but the sodium salt of commercial chromotropic acid was found satisfactory for the preparation of the reagent.

The wearing quality and other properties of vegetable-tanned and of chrome-retanned sole leather, R. W. FREY and I. D. CLARKE (*U. S. Dept. Agr., Tech. Bul. 169 (1930), pp. 18, figs. 2; abs. in Jour. Amer. Leather Chem. Assoc., 25 (1930), No. 4, pp. 133–151*).—Comparison was made by the Bureau of Chemistry and Soils of certain of the characteristics of vegetable-tanned leathers with those of chrome-retanned sole leather, the material used in the experiments having been of a "strictly comparable nature as the two kinds of leather used were made from alternate right and left halves of the same hides." The dividing, trimming, and tanning of the hides, the weight and area of the untanned and of the tanned sides, the location of half soles and test pieces in the hide, and the average thickness of the half soles are among the subjects taken up in the report of the preparation of the material for the experiments; and the trials themselves included the determination of the average backing strength and stretch of the leathers, data on individual half soles and test pieces according to position in the bend, the density of the leathers, their chemical analysis and their wearing qualities. The findings include the following:

"According to these data, 100 lbs. of long-haired, green-salted, cured hide yields 66 lbs. of vegetable-tanned sole leather, but only from 32 to 51 lbs. of chrome-retanned sole leather, depending upon the degree of retannage. When converted into vegetable-tanned sole leather the area of the cured side was slightly increased, the average increase being 4 per cent. When made into chrome-retanned sole leather the area was slightly decreased, the average decrease being 6 per cent. . . .

"Chrome-retanned sole leather of light or medium retannage is appreciably thinner than vegetable-tanned sole leather made from the same hide. For the hides used, the average thickness of the vegetable-tanned sole leather from the bend section was practically 8 irons, whereas that from the chrome-retanned leather of light or medium retannage was about 7 irons. Heavy retannage increases the thickness to practically the same as that of the vegetable-tanned leather. As measured over the bend section, the tensile strength of the vegetable-tanned leather is much greater than that of the chrome-retanned, being from 45 to 55 kg. more per centimeter of width. . . . Although the vegetable-tanned sole leather is appreciably stronger than the chrome-retanned leather, its percentage stretch at the breaking load is less, being on the average but 73 per cent of the stretch of the chrome-retanned leather. . . . On the average the light to medium retanned chrome sole leather, even though thinner than the vegetable-tanned leather, wore from 1.6 to 1.8 times, or from 60 to 80 per cent longer. The wear resistance of chrome-retanned sole leather decreases with increasing degree of retannage. The chrome-retanned half soles from the bend of heaviest retannage wore but 1.3 times, or 30 per cent, longer than the corresponding vegetable-tanned half soles. Out of a total of 82 test pairs, 74 of the chrome-retanned half soles wore longer. Only 3 of the chrome-retanned half soles wore through in less time than the vegetable-tanned half soles, and but 5 of them in the same length of time as the vegetable-tanned. These 5 were all from the most heavily retanned side. The data do not show that wearing quality is indicated by tensile strength nor that it is dependent primarily or entirely upon the total quantity of hide substance present per unit area of the leather. Moreover, no relationship is evident between either density or apparent density and wearing quality.

"Although the chrome-retanned sole leather wore appreciably longer than the vegetable-tanned, it showed several seriously objectionable features. It was quickly penetrable by water, it was slippery in wet weather, and it frequently lacked sufficient solidity to protect the foot against uneven surfaces, especially after about one-half the sole had been worn away. These tendencies were inversely proportional to the degree of retannage and consequently also to their wearing quality. The more heavily the leather was retanned the less readily it became wet, the less it slipped, and the greater was its solidity, but also the less was its relative wearing quality. . . . From these experiments, from other work, and from practical observations, there can be no doubt of the longer wear of leather entirely or predominately of a chrome tannage. Likewise, there is, as a rule, no question regarding the superiority of vegetable-tanned sole leather in respects other than wear resistance."

Specific gravity and Baumé gravity tables for turpentine, W. C. Smith and F. P. Veitch (*U. S. Dept. Agr. Circ. 110* (*1930*), *pp. 9*).—The readings of specific gravity and Baumé hydrometers standardized for the testing of turpentine at 60° F. were recorded from 32 to 96° F. in the case of 16 turpentines. "At 15.5° C. the specific gravities of these samples ranged from 0.8617 to 0.8756, thus covering as nearly as practicable the generally accepted range of 0.86 to 0.875." The experimental details of these determinations are given, and the results are collected in a conversion table for correction of observed specific gravity to specific gravity at 60° F. and a table of Baumé readings for correction to degrees Baumé at 60° F., each table covering at 1° intervals the range 32 to 95° F., inclusive.

A nontechnical description of the equipment and procedure for determining specific gravity of Baumé density in turpentine and a table for calculating pounds to gallons or gallons to pounds from the specific gravity or Baumé readings at 60° F. conclude the circular.

Washing cabbage improves quality of sauerkraut (*Wisconsin Sta. Bul. 410* (*1930*), *p. 18*).—Washing the cabbages before cutting was found to remove about 60 to 70 per cent of the bacteria normally present on the leaves, and it was further found that whereas about three-fourths of the organisms inside the cabbage heads were of the desirable lactic acid producing type, those on the outside of the head consisted of only about one-fourth of the desirable forms.

In actual practice, "kraut made from such washed cabbage is superior in flavor and aroma and much more uniform in character than kraut made from unwashed cabbage."

The gas formed in the fermentation of sauerkraut was found to consist of practically pure carbon dioxide, with "small traces of a sulfur-containing gas."

This work is attributed to W. H. Peterson, E. B. Fred, and C. H. Keipper.

METEOROLOGY

Proceedings of the commission of agricultural meteorology, 1929 (*Organisation Météorologique Internationale. Commission de Météorologie Agricole. Procès Verbaux de la 3. Réunion, Copenhague, 1929. Stockholm: Statens Met. Hydrog. Anst. (Pub. 276), 1929, pp. 101, figs. 6*).—This is an account of the meeting of the commission at Copenhagen, September 9 to 14, 1929, at which resolutions were discussed and adopted favoring an international review of scientific work in agricultural meteorology through the International Institute of Agriculture; the use, by agronomists, biologists, and meteorologists, of the week as the time unit in reporting agricultural meteorological data; closer cooperation between agronomists, biologists, and meteorologists in agricultural meteorological studies; preparation of selected lists of plants for phenological observations; use of Schmidt's thermoelectric methods for recording temperature of the soil; study of meteorological conditions on small experimental plats; detailed studies of evaporation and transpiration as influenced by local conditions; and collaboration of meteorologists and agricultural specialists in the study of weather and climate in relation to yield of crops. Among the papers presented were The Week as a Phenological Time-Unit, by W. N. Shaw (pp. 31–40); Measurement of the Temperature of the Lower Layers of the Air, by A. Ångström (pp. 40–43); Dependence of Yield on Weather Conditions [trans. title], by [P.] Holdefleiss (pp. 43–47); and Determination of Relative Frost Resistance of Different Varieties of Plants through Artificial Refrigeration [trans. title], by Å. Åkerman (pp. 86–98).

The preceding meeting of the commission, held in 1926, has been noted previously (E. S. R., 58, p. 511).

Meteorology in application, G. WALKER (*So. African Jour. Sci., 26 (1929), pp. 21–28, figs. 8*).—This paper discusses briefly various ways in which the "weather affects the well-being of man, beast, or plant," and in which "meteorology can render useful service." It is stated that "the first essential for an agricultural region is a network of climatic stations providing data of humidity and temperature as well as rain."

Correlation between weather and crops with special reference to Punjab wheat, M. V. UNAKAR (*Indian Met. Dept. Mem., 25 (1929), pt. 4, pp.* [2]+*145–161, pls. 2*).—This is a report on a preliminary study of the weather conditions (temperature and rainfall) prevailing from the time of sowing to the date of maturing of wheat (October to March) in the Punjab, showing that "the area sown could be calculated at the end of October with an accuracy represented by a total correlation coefficient of 0.73, while the gross outturn and the outturn per unit area could be calculated at the end of March with an accuracy represented by total correlation coefficients of 0.75 and 0.65." It was found that the meteorological forecasts improve with the advance of the season.

Climatological data for the United States by sections, [November–December, 1929] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 16 (1929), Nos. 11, pp.* [*197*], *pls. 3, figs. 3; 12, pp.* [*201*], *pls. 2, figs. 4*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for November and December, 1929.

Weather in Ohio during the year 1928, W. H. ALEXANDER and C. A. PATTON (*Ohio Sta. Bul. 446 (1930), pp. 204–215, figs. 3*).—Data for temperature and precipitation at the station at Wooster and in the State as a whole are summarized as in previous years. Frost-free periods at the station, 1894–1928, are also recorded.

It is stated that the record for 1928 shows that "(1) the temperature was subnormal during five months (March, April, May, June, September), (2) the precipitation averaged above normal during four months (slightly in February, July, and November, decidedly in June), (3) the snowfall was less than one-half the normal, (4) the number of days with precipitation was exactly normal, (5) the temperature range (109) was the smallest with four exceptions in the last 46 years, (6) the annual mean temperature for the State was slightly (0.1) below normal, although the mean for the northern section was slightly above, (7) the average number of days clear was large, and (8) although the length of the crop-growing season was somewhat less than the average there was little if any loss of crops from early frosts."

SOILS—FERTILIZERS

Soils and soil management, C. E. MILLAR (*St. Paul: Webb Book Pub. Co., 1929, pp. 477, figs. [248]*).—"In preparing this text the author has attempted to analyze each soil problem as it might arise on the farm, in the garden, or about the city or country home, before beginning a discussion of ways of solving the problem." It is stated also that "the farmer should find the answer to many of his questions regarding soil management in this book, for during its preparation the author has kept in mind the questions which constantly recur in the many letters received from farm operators." The development and care of lawns and gardens is also given considerable attention.

[Miscellaneous soil experiments of the Ohio Station] (*Ohio Sta. Bul. 446 (1930), pp. 52–56*).—This group of brief items comprises the following:

Soil reaction experiment at Wooster, E. E. Barnes.—The experiment has been laid out in four sections, each devoted to a different cropping arrangement and divided into five ranges kept as nearly as possible at the reactions pH 4.5, pH 5, pH 6, pH 7, and pH 8.

The soil reactions, the hay yields of 1928, and the corn yields of 1929 are tabulated, and it is noted that the corn yield was best with respect to soil reaction on the pH 7 range, a little less on the pH 8 range. "When the yields of corn following the different legumes were averaged for all the ranges, those of the mammoth and alsike clover plats were the highest. Likewise when they are averaged for the three ranges of highest pH value, the yield following alfalfa exceeded that following alsike clover. The yield of corn following timothy hay was very low in all ranges."

Composition of colloidal material in Ohio soil profiles, T. C. Green and J. G. Steele.—In a study of the colloidal components of the various horizons of Rossmoyne silt loam, carbonates were found to have been leached to a depth of from 8 to 10 ft. "As a result of long time weathering an extreme development of horizons with markedly different physical characteristics has resulted. There was little variation in the chemical composition of the extracted colloid, except in the surface horizon and in the parent material. However, the variation in the activity of the colloid as measured by the heat of wetting and moisture absorption was rather large. Apparently colloidal materials with somewhat similar chemical composition may show considerable variation in activity."

Effect of leaking natural gas upon the soil, C. J. Schollenberger.—The soil long exposed to this gas, leaking from buried pipes, was found to have been blackened and injured in texture and to have acquired "a peculiar odor suggestive of stagnant mud as well as the odor of gas." The manganese oxides normally present had been "largely reduced to manganous oxide, active as a base in the soil." Some ammonia, also, was found to have accumulated, and "the gassed soil was less acid than the normal soil near by, undoubtedly the effect of the increase in active bases." Pot experiments showed, however, that under conditions of good aeration the active manganese quickly returned to insoluble forms and the soil supported a good growth. "The effects appear to be due solely to exclusion of air from the soil by the gas, establishing anaerobic conditions and permitting microorganisms which flourish under such conditions to reduce soil constituents normally oxidized."

Determination of soil reaction, C. J. Schollenberger.—A study of the applicability of the quinhydrone electrode to this work led to the conclusion that the quinhydrone reduces the higher oxides of manganese, so that "the reduced manganese, being an active base, tends to cause the indicated reaction to drift toward the alkaline side; but the oxidation of the quinhydrone results in a shift in the quinone-hydroquinone ratio, which must be unity for accurate indications, causing a drift toward the acid side. These opposing tendencies appear to be largely responsible for the wavering potentials and slow drifts often noted in working on soil by this method. Some experiments indicate that the hydrogen electrode may cause a similar but comparatively very slight reducing action. Tests have been made of electrodes cut from the manganese dioxide minerals pyrolusite and psilomelane, which have been found to function as pH electrodes, in the hope that they would furnish results unaffected by oxides of manganese in the soil. In soil suspensions these come to equilibrium so slowly, however, that they offer little promise of practical utility."

Rate of decomposition of limestone in soil, R. M. Salter and C. J. Schollenberger.—The relative rates of decomposition in the soil and of solution in acid buffer solutions of calcite and dolomite limestones were determined in an investigation of the comparative value of the two types of liming material. Mixtures of the extreme types of lime and of some intermediate varieties with six individual soil types were exposed to natural weather conditions, an example of the results being a 90 per cent decomposition of the best calcite limestone at the time of the last sampling, as compared with a 70 per cent decomposition of the purest dolomite.

"Tests of solubility in a calcium acetate-acetic acid buffer solution indicated that the relative order of solvent action in the reagent and of decomposition of the limestones in the soil were similar, but not by any means in the same ratios. It seems, therefore, that the chemical test of solubility in reagents may enable one to decide that one limestone may be decomposed more rapidly than another in the soil, but not to assign to them a definite ratio of resistance to the agencies of decomposition in the soil."

[Soil and fertilizer studies at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 1–12, figs. 9*).—The gravity of the erosion problem, in the western and southwestern sections of the State especially, is stressed, the aggravating effect of cultivation and the normal character and progress of erosion damage are briefly described, and the advising of various control measures is reported, together with the projected cooperation of the station with the Lake States Forest Experiment Station in a study of erosion.

Limonite has been found by M. C. Ford to react rapidly with soluble phosphates to form a nearly insoluble basic ferric phosphate, thus rendering added phosphates unavailable.

The use of highly concentrated commercial fertilizers such as 6–24–24 was found by F. L. Musbach to be profitable on potatoes. A. F. Heck, Musbach, and A. R. Whitson demonstrated the value of mixing manure spread on the field immediately with the soil. Analyses by J. A. Chucka and E. Truog of the activated sludge from the Milwaukee sewage disposal plant revealed in each ton 0.78 lb. of copper, 0.022 lb. of iodine, 0.36 lb. of manganese, and 3.52 lbs. of zinc.

A pipette method of mechanical analysis of soils based on improved dispersion procedure, L. B. Olmstead, L. T. Alexander, and H. E. Middleton (*U. S. Dept. Agr., Tech. Bul. 170 (1930), pp. 23, figs. 2*).—The method of mechanical soil analysis developed for use in the soil physics laboratory of the Bureau of Chemistry and Soils is described.

In the pretreatment of the soil the organic matter is removed with hydrogen peroxide, but the hydrochloric acid treatment, used in the international method, is ordinarily omitted. A method of removing organic matter in the presence of manganese dioxide is described. Soluble matter is removed by washing and filtering with Pasteur-Chamberland suction filters. The sample is dried and weighed, and this weight is the basis of calculation of percentages of material in each size class, when the results are for use in textural classification. In all operations prior to dispersion the sample remains in an extra tall form beaker. The sample is deflocculated by shaking in a dilute sodium oxalate solution. The colloid, clay, and fine silt are separated from the sands by means of a 300-mesh sieve. The clay and colloid are determined by sedimentation, the pipette method being used. The procedure is designed for accurate and rapid analysis.

Investigation of dispersion aids, incidental to this method, disclosed the fact that acid treatment introduced undesirable solution losses and was not necessary for dispersion, even in calcareous soils, particularly when sodium oxalate was used as the dispersing agent.

How farmers of the State may have their soils examined and appraised, C. B. Williams (*North Carolina Sta. Agron. Inform. Circ. 48 (1930), pp. [4]*).—Elementary sampling instructions are given.

Soil survey of Essex County, Massachusetts, W. J. Latimer and M. O. Lanphear (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1925. No. 14, pp. 56, fig. 1, map 1*).—This county, in the extreme northeastern part of Massachusetts, occupies an area of 318,080 acres, possesses physiographic features characteristic of the New England coast, and is generally well drained by the Merrimack, Ipswich, Saugus, and other rivers.

The most extensive among the classified types noted in this survey (carried out in cooperation with the Massachusetts Department of Agriculture) is Merrimac fine sandy loam, which occupies 7.9 per cent of the total area of the county and is one of the most important agricultural soils. In all, 17 series were mapped to include 29 types.

Of the rough stony land, occupying 10.7 per cent of the area surveyed, "large areas . . . support much good timber;" tidal marsh, 7.5 per cent, "is well suited to strawberries" when properly drained; meadow, 4.1 per cent, "is fairly important in the agriculture of the county" and is "well suited to . . . market garden crops that thrive on fairly moist soil." Muck, 5.2 per cent, and peat, 6.8 per cent, were found suitable when drained for the moisture-preferring market garden crops.

Agriculture and soils of the coastal plain of Palestine.—Soil survey of the Jaffa Sub-District, H. E. Z. Raczkowski (*Palestine Dept. Agr. and Forests, Agr. Leaflets, 11. ser., Soil Survey No. 1 [1929], pp. 24, pl. 1*).—The usual soil survey information is given, with the addition of some detailed chemical and mechanical analyses given in an appendix.

Soil bacteria prove worth to farm and industry (*Wisconsin Sta. Bul. 410 (1930), pp. 16, 17*).—Under this head is given a very brief note of work of E. B. Fred, E. McCoy, E. G. Hastings, W. M. Higby, and W. H. Peterson on certain of the less well known soil bacteria.

Some 20 pure cultures of anaerobic butyric acid-forming bacteria isolated from Wisconsin soils were studied, together with 14 other strains received from laboratories in Europe. All of these cultures demonstrated ability to fix free nitrogen in the soil independently of any association with plants. Wide variations in the capacity between the various strains were noted, the more efficient strains fixing more than eight times as much nitrogen as the less effective strains. The behavior of the strains was carefully compared with the use of various kinds of culture media, and they were classified on a basis of their well-defined characteristics. These studies were found to throw much new light on the rôle of these organisms in building up the nitrogen supply of the soil and also to indicate their possibilities for use in industry.

"Certain of these anaerobic soil organisms have recently come into wide use in the manufacturing industry, particularly in the production of solvents by the fermentation of ground corn. These solvents are widely used in the new lacquer industry."

The management of peat and alkali soils in Iowa, W. H. Stevenson, P. E. Brown, and J. L. Boatman (*Iowa Sta. Bul. 266 (1930), pp. 81–100, figs. 8*).—The peat soils were found to require before other treatment ample tile drainage with adequate outlets and provision for the removal of flood waters from adjacent uplands. It appeared best to expose peat soils to frost, snow, and rains by means of fall plowing, which treatment was found to hasten the decomposition of the peat; and in the shallower parts deep plowing had the advantage of enriching the soil and improving its physical condition by the admixture of the heavy clay subsoil. Frequent cultivation was found also to be of value both in opening peat soils and in encouraging their decomposition, and in controlling the weed growth difficulty characteristic of newly drained peats.

The choice of crops for newly drained peats is discussed.

The peat soils here considered were found to have an ample lime content and to be rich not only in organic matter but also in nitrogen. For corn and small grains, grown after two or three years of pasture or cropping to vegetables, following drainage, 200-lb. applications of superphosphate, potassium chloride, or both, were found often profitable.

Drainage and manuring to rid the soil of excess of soluble salts, together with the plowing under of straw and green manure crops—sweetclover having been found one of the most valuable of these—were indicated as among the most useful preliminary treatments for "alkali" spots. Potassium chloride at 200 lbs. to the acre often proved effective, and superphosphate occasionally so.

The use of peat in the greenhouse, A. Laurie (*Michigan Sta. Spec. Bul. 194 (1930), pp. 28, figs. 20*).—Peat used alone as a substitute for the usual compost of soil and manure was not satisfactory, but in mixture with as little as 1/20 of its volume of manure the peat was in some cases superior to the ordinary compost, and "when peat is used as a mulch about 1 in. deep over the surface of soil in benches, or when it is incorporated in soils used in potting at the rate of 1 part to 4 or 5 it results in a marked increase in growth and in larger and better flowers in the case of most greenhouse crops." Also, "when supplemented with very small amounts of stable manure, 1 part to 20 by volume, it serves as a very suitable substitute for that material in greenhouse practice."

It was further found that peat served as a partial substitute for commercial fertilizers, sedge peat proving much more valuable, either as a mulch or for incorporation in the soil, than sphagnum peat. The sphagnum peat was, however, "found useful as a medium for the rooting of softwood and hardwood cuttings of a number of kinds that are difficult to root in sand."

The application in small quantities of the sulfates of manganese, copper, and iron in some cases stimulated the growth of plants on peat.

[Studies with phosphorus] (*South Dakota Sta. Rpt. 1929, p. 7*).—The present year's results are considered less definitely indicative than those of the previous year (E. S. R., 61, p. 20) of a superiority of double superphosphate to other phosphatic fertilizers. "It is, however, fairly apparent that relatively larger increases are still coming from rock phosphate."

Inspection of commercial fertilizers for 1929, T. G. PHILLIPS, T. O. SMITH, and J. C. FRITZ (*New Hampshire Sta. Bul. 248 (1929), pp. 12*).—A general improvement in the dependability of fertilizer materials offered for sale in New Hampshire in 1928–29 was indicated in analyses of 117 brands showing but 12.3 per cent of deficiencies, on the basis of the total number of guaranties, as against 19.6 per cent shown by the analyses of the previous year. Also, "many of the deficiencies were comparatively negligible, the small deficiency in one constituent being offset in value by overrun in other constituents."

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1929, C. S. CATHCART (*New Jersey Stas. Bul. 493 (1929), pp. 29*).—The usual report of analyses and guaranties is made for those samples not included in the former report for 1929 (E. S. R., 62, p. 721). The present bulletin contains also a discussion of the inspection results as a whole.

Fertilizer registrations for 1930, C. S. CATHCART (*New Jersey Stas. Bul. 495 (1930), pp. 23*).—Report is made of the fertilizer brands and compositions registered for sale in 1930.

AGRICULTURAL BOTANY

Photoperiodic adaptation in green plants [trans. title], V. N. LIUBIMENKO (LOUBIMENKO) and O. A. SHCHEGLOVA) (SZEGLOFF) (*Zhur. Russ. Bot. Obshch. (Jour. Soc. Bot. Russie), 12 (1927), No. 1–2, pp. 113–162, figs. 11; Fr. abs., pp. 160–162*).—Experimentation was begun in Leningrad in 1922 with *Phaseolus vulgaris, Hordeum vulgare,* and *Sinapis nigra,* and was continued with *Benincasa cerifera, Momordica charantia, Gossypium herbaceum, Soja hispida,* and *Papaver nudicaule,* these plants being exposed continuously each day to sunshine for 10, 8, 6, 4, or 2 hours. The results upon growth and development are detailed.

The periodicity of illumination shows a strong influence, not alone on the production of total dry matter but also on its apportionment among the various organs and on their development. The influence of periodicity of illumination is based upon the twofold action of light upon green plants; that is, the indirect action by means of carbohydrates elaborated during photosynthesis and the direct action in photochemical transformations of plastic substances produced during the growth of cells and tissues.

The growth of seedlings of the canteloup, Cucumis melo, in the absence of exogenous food and light, R. PEARL, A. A. WINSOR, and J. R. MINER (*Natl. Acad. Sci. Proc., 14 (1928), No. 1, pp. 1–4, fig. 1*).—In accordance with the principles of plant energetics previously dealt with (E. S. R., 58, p. 629), the authors have for two years carried out numerous experiments with cantaloupe seedlings grown under sterile conditions in the absence of exogenous food and light, so that any growth would depend only on matter present as a part of the inherent organization of the plant plus sterile (distilled) water obtained through the roots.

In view of the facts cited and evidence presented, it is considered as safe to conclude "that not only is the form of the distribution of individual differences in inherent vitality the same as for total vitality, as has previously been shown by Pearl, but also the form of the growth curve is essentially the same when growth is the expression either of inherent vitality or of total vitality. In both cases (so far as concerns *C. melo*) the growth follows some form of the generalized logistic curve."

The form of the growth curve of the canteloup (Cucumis melo) under field conditions, R. Pearl, C. P. Winsor, and F. B. White (*Natl. Acad. Sci. Proc., 14 (1928), No. 12, pp. 895–901, figs. 2*).—In continuation of the reports on the studies referred to above, the present paper gives the results of observations on the growth of the cantaloupe plant under normal field conditions.

While the relation between number of nodes and length of branch is not strictly linear, the departure does not materially affect the form of the growth curve obtained whichever measure is used. Conformities and departures are detailed, with discussion. "More precisely stated, the relation between attained size and relative time in the development of the cantaloupe plant is, to a first approximation, identical whether the environment in which it has its being is highly variable in respect of temperature and all other physical and chemical particulars, or is, to a high degree, constant. The pattern of the events which constitute the life cycle of the organism is primarily and basically determined by the physicochemical organization or pattern of the organism itself."

The effect of temperature on the development of the cotton plant [trans. title], G. S. Zaitsev (Zaitzev) (*Trudy Turkestan. Selek. Sta.* (*Trans. Turkestan Plant Breeding Sta., Tashkent*), *No. 7 (1927), pp. 76, figs. 12; Eng. abs., pp. 73–75*).—Temperature, the most important factor contributing to determine the rapidity of the course of development of the cotton plant, affects the more important phases, as germination, appearance of the first leaf and buds, blooming, and dehiscence, and also the less important intermediate phases, which determine the alternation of leaves, buds, flowers, and opened bolls. This correlation, which is always inverse, between the time required for important phases and temperature, is approximately unity in all cases. Relations are detailed.

Transpiration studies [trans. title], E. S. Kuznetsov (*Zhur. Opytn. Agron. Îugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *3 (1927), No. 2, pp. 154–170, fig. 1; Ger. abs., p. 173*).—A preliminary account is given, with a guarded statement of the partial results thus far, of studies along the lines followed in the earlier work of Briggs and Shantz, whose methods are criticized.

It is thought that the influences of meteorological factors may explain certain anomalous variations in transpiration. Only the general forms of the curves and the averaged values of the variations should be regarded as characteristic of the plant.

Post-mortem plant respiration [trans. title], J. Bodnár and P. Hoffner (*Kisérlet. Közlem., 31 (1928), No. 3, pp. 145–165; Ger. abs., pp. 164, 165*).—The anaerobic respiration occurring in meal from peas and lupines, considered on the basis of the ratio alcohol : CO_2, exactly agrees with alcoholic fermentation.

Plant nutrition studies in relation to the triangular system of water cultures, H. F. Clements (*Plant Physiol., 3 (1928), No. 4, pp. 441–458, figs. 6*).—Defining the term "best" or "normal" plant as here implying the production of vegetative growth such as to insure reproduction of the highest order and a well-balanced plant as one that develops its usual functions normally, and assuming that any attempt to determine such desired conditions must not only require quantitative data but must consider also other than the external expression of the plant alone, the author presents an attempt "to throw light on the organic nutrition of the plants grown in the triangle and to study the internal conditions in relation not only to the various combinations of salts, but also to the various exposures of light."

The Scotch Beauty field pea was grown in the culture solutions previously employed by Shive (E. S. R., 34, p. 333), in which potassium nitrate was omitted from the Knop solution as used by Tottingham (E. S. R., 31, p. 425), and calcium nitrate, magnesium sulfate, and potassium dihydrogen phosphate were used, with iron as tartrate (other iron forms causing partial precipitation of the other salts). The methods, conditions, and modifications are detailed.

From the data it is concluded that such criteria as length of plants, green weight, and dry weight can not give a correct idea of the best balance of salts for growth. Such indexes as highest ash content and highest nitrate content are presented, but these are shown to be erratic as to position and hence unreliable, and this index unreliability is also claimed as to the soluble forms of carbohydrates. It is shown that KH_2PO_4 has a very marked influence on nitrogen assimilation. In the triangle, very definite positions are assumed by the highest nitrogen and highest carbohydrate areas, respectively. The positions of high nitrogen and high carbohydrate areas are at opposite sides of the triangle and leave an area in which the best plants of the triangle may presumably be found.

Shorter exposure to light results in different positions for the best cultures. This agrees with expectation in view of the behavior of the two large groups of reserves found in the plants grown under the shorter light exposures. A possible rôle of the triangular system of water cultures in future fertilizer requirement research is indicated.

The influence of one ion on the accumulation of another by plant cells with special reference to experiments with Nitella, D. R. Hoagland, A. R. Davis, and P. L. Hibbard (*Plant Physiol., 3 (1928), No. 4, pp. 473–486, figs. 4*).—"Taking all the data into consideration it is found very difficult to explain them on any other than an ionic basis."

The physiological bases of life persistence in plants of southern Russia.—I, Tolerance for salts [trans. title], A. A. Rikhter (Richter) (*Zhur. Opytn. Agron. I͡ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *3 (1927), No. 2, pp. 3–16, figs. 3; Ger. abs., p. 16*).—Balanced solutions of salts are tolerated by plants in much higher concentrations than are single-salt solutions. The osmotic values in plants which may become necessary, even indispensable, to counterbalance those of concentrating external solutions are attained by plants of different groups in different ways. Wheat, Helianthus, Amaranthus, and Artemisia can of themselves increase the osmotic forces in their internal juices above the ordinary values. Plants adapted to saltness, as Salsola, Suaeda, and Salicornia, can without injury take in from the external media the salts necessary to prevent disadvantageous exosmosis. The plants of the first group show high root permeability. The specific capability for excluding salts sets the limits as to concentrations which these plants can withstand. The failure of impermeability allows an abnormal accumulation of salts in the plant saps and thus brings about a lowering of the life processes. The plants of the second group take up salts harmlessly, thereby increasing the osmotic pressure of their saps.

An account of the nutrient substances taken from the soil by the cotton plant [trans. title], S. A. Kudrin (*Trudy Uzbek. Selsk. Khoz. Opytn. Sta., No. 4 (1928), pp. 12–37, figs. 5*).—On the basis of analyses made on several varieties of cotton (*Gossypium hirsutum*), primarily on variety No. 182, the author states that this variety, when grown under irrigation in Turkestan, may show the largest increase in the organic total at the stage of ripening and a later decrease due primarily to the falling off of the dying plant parts. A decrease with age was noted in the proportion of nitrogen and in that of ash. The bolls and the seeds showed the largest amounts of nitrogen and of phosphorus, and the leaves and the stalks the largest amounts of calcium and of magnesium. Decrease occurred with advance in age in the relative amounts of all nutritive substances in the stalks and fiber, as well as in the relative amounts of nitrogen and phosphorus in the leaves and of calcium and magnesium in the seeds. At the same time an increase was noted in the relative amounts of nitrogen and of phosphoric acid in the seeds, also of calcium and magnesium in the leaves. With age, translocation occurs of nitrogen and ash constituents from the vegetative into the reproductive parts. While the nitrogen and the phosphoric acid of the reproductive organs comprised, in the last growth stages, two-thirds of the total in the plant, calcium remained chiefly in the vegetative parts, and magnesium distributed itself uniformly throughout the plant.

As regards the accumulation of the principal nutrients during the stage of blooming and boll formation, that of nitrogen is more rapid than is that of phosphorus and of magnesium. A fairly large supply of nutrients per unit area of soil is required for cotton. However, these nutrients are during growth concentrated in that portion of the plant which may be left to the soil (the cottonseed cake). Because of the small amounts of the nutrients in the fiber, cotton culture may be continued without serious lowering of nitrogen or of ash constituents, provided the other constituents of the plant are returned to the soil.

I, Experimental support of formaldehyde assimilation hypothesis. II, The enzymatic condensation of formaldehyde to sugar [trans. title], J. Bodnár, L. E. Róth, and K. Bernauer (C. Bernauer) (*Kisérlet. Közlem., 31 (1928), No. 3, pp. 166–186; Ger. abs., pp. 185, 186*).—In experimentation with leaves of *Tropaeolum majus* the formaldehyde supplied was decreased and the separation of CO_2 increased. It is claimed that through enzyme action formaldehyde furnished to the leaves reappeared as reducing sugar.

Influence of external factors on the activity of diastase and peroxidase [trans. title], H. Kern (*Ztschr. Bot., 21 (1928), No. 4–5, pp. 193–252*).—Tabulation and detailed discussion are given of this work, most of which was done with maize.

Anatomical material for the study of growth differentiation in higher plants, R. Bouillenne (*Plant Physiol., 3 (1928), No. 4, pp. 459–471, figs. 13*).—Physiological and anatomical investigations made during the progress of a botanical expedition in the Brazilian Amazon referred to the "stilt" roots of the palm, *Iriartea exorrhiza*. It is suggested that, under the conditions stated for this palm, where the vegetative organs, roots, and stems are formed at the same time, the parallel variations of structure pointed out may be explainable by the modifications of the physiological conditions which surround the meristem in the course of development.

Studies on callus tissue, D. Kostoff (*Amer. Jour. Bot., 15 (1928), No. 10, pp. 565–576, pls. 5, figs. 4*).—Intergeneric and interspecific graft unions were made among Solanaceae to study the possibility of antibody production, and in this article observations on the callus are presented.

The callus tissues joining the stock and the scion are chiefly the product of the stock, just above which large accumulations of starch occur, causing asymmetry. Near the callus line, the scion produces such proliferations as tumor formations and numerous small leafy shoots or roots. The cambium and its derivatives interrupt the callus line first in the lowest zone.

When scion activity predominates and kills the stock, necrosis begins at the lowest zone of the joining tissues and then spreads in the stock in all directions. The gradual disappearance of the cells injured during the graft operation is due apparently to certain lytic phenomena. Only in young calluses (15 days old) were bacteria noted in the callus between the scion and the stock plane. Abnormal vascular cells, either single or in groups, were found in the joining tissues in the pith region and in the proliferation tissues. Abundant accumulations of sand and of calcium oxalate crystals around the callus were noted. Pigment, when present, is delimited by the callus. Proliferations, asymmetry, and other phenomena in the callus are interpreted as due to specificity and interactivity of the graft components.

Though no strictly Lamarckian influence of stock on scion was observed, certain plants, which before grafting exhibited normal meiosis and produced uniform progeny, after being used as scions showed nondisjunction and other abnormal types of meiosis and produced a variable progeny.

The mechanism of guard cells.—II, The adjacent cells and their function [trans. title], A. A. Rikhter (Richter) and E. I. Dvoretskai͡a (E. J. Dworetzkaja) (*Zhur. Opytn. Agron. I͡ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *3* (*1927*), *No. 2, pp. 51–59, fig. 1; Ger. abs., p. 171*).—Careful study of the dynamics of the chemical and osmotic processes in the epidermal apparatus of the plants investigated (mostly economic) gives no justification for ascribing to the neighboring cells and particularly the other epidermal cells any part in the action of the guard cells of the stomata.

The preparation of chlorophyll, F. M. Schertz (*Plant Physiol.*, *3* (*1928*), *No. 4, pp. 487–497*).—A method is described for the extraction and purification of chlorophyll, α and β.

A method for the determination of inorganic nitrogen in plant extracts, A. C. Sessions and J. W. Shive (*Plant Physiol.*, *3* (*1928*), *No. 4, pp. 499–511, fig. 1*).—It is claimed that from a consideration of the data here tabulated, and from tests herein only described, nitrates in plants may be determined with a high degree of accuracy. It is believed that needed modifications may make the method generally useful in determining the inorganic nitrogen fractions of plant biological materials.

GENETICS

✓ **Inheritance in barley with special reference to the color of caryopsis and lemma**, G. F. H. Buckley (*Sci. Agr.*, *10* (*1930*), *No. 7, pp. 460–492*).—The inheritance of color in the caryopsis and lemma in barley and the relation of these characters to several other plant characters were studied at the University of California.

Factor pairs giving a simple Mendelian ratio in F_2 included 2-rowed v. 6-rowed (a^s a^t), long v. short rachilla hairs (*L l*), hooded v. awned (*K k*), hulled v. naked (*N n*), straight v. curved peduncle (*Cr cr*), black v. white lemma and pericarp (*Bk bk*), white v. orange lemma (*Br br*), purple v. white lemma (*P p*), blue v. white aleurone (*Bl bl*), and normal v. albino seedling (Alb^t alb^t). Red v. white pericarp was found to depend upon two pairs of factors (*R r* and *O o*), both of which must be present in the dominant form for the development of red pericarp. Possibly one of these pairs (*O o*) may be necessary for the development of *P*, the gene for purple lemma.

Complementary factors (*I i* and *J j*) were found which together in the dominant form inhibited the expression of *R* and *P*. Three pairs of factors (*C c*, *E e*, and *F f*) were involved in the development of purple veins in the lemma. All three must be present in the dominant form for the expression of color. Three linkage groups were established, namely, *C–A–P–R*, *L–O–Br*, and *K–Bl*.

It appeared very probable that *N n*, *E e*, and *Bk bk* represent three additional groups.

✓ **Chromosome conditions in the second and third generations of pentaploid wheat hybrids,** J. A. Jenkins and W. P. Thompson (*Canad. Jour. Research, 2 (1930), No. 2, pp. 162–170*).—The numbers and mating capabilities of the chromosomes were determined in numerous F_3 plants and their offspring in Marquis common wheat (42 chromosomes) × White Spring emmer (28) and Marquis × Iumillo durum (28) wheat in studies at the Universities of Saskatchewan and California. Chromosome numbers were much nearer those of the parental types than was to be expected if all germ cells could function and all zygotes develop. Many expected chromosome types did not appear at all. A high percentage of F_2 had only 14 bivalent chromosomes and 0 to 7 univalents, which tended to revert rapidly to the 14-bivalent condition of emmer. F_3 in this group did not have more than 14 bivalents nor more univalents than their F_2 parents. A chromosome formula for all of the group of F_2 with more than 14 bivalents may be written $(14+x)$ bivalents$+(7-x)$ univalents. These tended to revert to the 21-bivalent condition of common wheat. F_3 in this group did not have fewer bivalents nor more univalents than their F_2 parents.

Species crosses in the genus Cucurbita, E. F. Castetter (*Amer. Jour. Bot., 17 (1930), No. 1, pp. 41–57, figs. 3*).—Determinations of the 2n chromosome number in three species of curcurbits cultivated in the United States, namely, *C. maxima*, *C. pepo*, and *C. moschata*, showed them to be 40, 40, and 48, respectively. Crosses between *C. maxima* and *C. pepo* were much more difficult than those between either species and *C. moschate*. *C. pepo* ♀ × *C. maxima* ♂ yielded self-fertile progeny, while the reciprocal cross yielded all self-sterile seedlings. *C.* pepo ♀ × *C. moschata* ♂ yielded self-fertile progeny, with the reciprocal cross impossible. *C. maxima* ♀ × *C. moschata* ♂ yielded progeny freely, but the F_1 plants were all self-sterile on account of abortive pollen though they yielded fruit with viable seeds upon back crossing. The reciprocal cross was less easily accomplished. Parthenocarpy was frequently observed, but no cases of parthenogenesis occurred.

The evolution of dominance (*Amer. Nat., 63 (1929), No. 689, pp. 553–561*).—Further discussion of Fisher's theory on the evolution of dominance is presented by Fisher (pp. 553–556) and Wright (pp. 556–561) in continuation of their respective comments (E. S. R., 62, pp. 12, 513).

The calculation of linkage values.—A comparison of various methods, M. Alam (*India Dept. Agr. Mem., Bot. Ser., 18 (1929), No. 1, pp. [2]+56, figs. 6*).—The author has compared methods of calculating linkage values from an F_2 population and appraised the merit of each by the χ^2 measure of discrepancy. The superiority of the product ratio method suggested by Fisher and Balmukand (E. S. R., 60, p. 630) was established. Simple formulas for calculating linkage values directly from the product ratio were also developed which may readily be applied to complex Mendelian relationships. A general method was presented for expressing the value of p^2 in terms of the zygotic classes *a*, *b*, *c*, and *d*, and for any zygotic distribution, which may be of value in developing new formulas applicable to special cases.

The effect of varying the duration of X-ray treatment upon the frequency of mutation, C. P. Oliver (*Science, 71 (1930), No. 1828, p. 44–46*).—In studies of the effects of variations in the duration of X-ray treatment of male Drosophila on the production of lethal mutations in the X chromosomes, it was found that the total number of lethals produced was directly proportional to the duration of the treatment. The percentages of observed lethals were at 3.5 minutes' exposure 1.18±0.135, 7 minutes 2.99±0.256, 14 minutes 4.56±0.428, 28 minutes 9.63±0.74, and 56 minutes 15.85±1.19. This was very close to the expected percentages from the equation log $q=kt$, in which q is the proportion of escaping nonlethal cells, t the time of treatment, and k a constant.

Duration of the effects of X-rays on male germ cells in Drosophila melanogaster, F. B. Hanson and F. Heys (*Amer. Nat., 63 (1929), No. 689, pp. 511–516*).—In irradiation experiments with *D. melanogaster*, using radium and X-rays, it was found that sperm aged in the male through prevention of copulation showed no decrease in mutation rate. When the males were continuously mated the influence of the radiation on the mutation rate was apparent for matings occurring within two weeks, but after that time there was a pronounced drop. This is taken to indicate a differential effect of radiation on immature and mature male germ cells.

Changes in the rate of mutability of the mutable miniature gene of Drosophila virilis, M. Demerec (*Natl. Acad. Sci. Proc., 15 (1929), No. 12, pp. 870–876*).—The author describes three lines of *D. virilis* in which the mutability of the miniature gene differs. In one line the gene is mutable in both the germ cells and somatic cells, it remains almost constant in another line, and in the third line mutability is limited to the somatic cells. Changes were also observed from one line to another.

A possible relation between natural (earth) radiation and gene mutations, F. B. Hanson and F. Heys (*Science, 71 (1930), No. 1828, pp. 43, 44*).—The authors report that exposing male Drosophila to the natural radiation in an abandoned carnotite mine, where the ionization of the air was 0.39 times as intense as that from 1 mg. of radium when passed through a 0.156 in. lead filter, increased the production of lethal mutations in the X chromosome from 0.076 ± 0.051 per cent in the laboratory to 0.245 ± 0.062 per cent in the mine.

Genetic experiments with sheep and swine, B. L. Warwick and D. S. Bell (*Ohio Sta. Bul. 446 (1930), pp. 153, 154*).—Studies of the inheritance of black in Shropshire, Merino, and other common breeds of sheep have indicated that black is recessive, although two exceptions in the production of white lambs from black dams and a black ram occurred during the year. Lambs with very dark or spotted infantile coats were found to have dark fibers mixed with the white as they grew older. The chalk-face or frosted-face character of Merinos is evidently due to a combination of dominant factors. Other studies with sheep indicated that the ridgeling or cryptorchid characteristic is hereditary. All the ridgeling rams dropped in the station flock were sired by one ram or by one of his sons or grandsons.

Studies, by Warwick, of the inheritance of color in swine indicated that Poland-China black is due to a single pair of dominant factors, but that the amount of black appearing is controlled by multiple factors. Red is due to two pairs of factors, and its appearance is influenced by other factors which are recessive and may result in very dilute cream or white pigs. Two pairs of recessive factors seem to be responsible for the inheritance of hernia.

Three kinds of white in cattle that may be of the same phenotype [trans. title], O. Wriedt (*Ztschr. Tierzücht. u. Züchtungsbiol., 13 (1929), No. 3, pp. 371–375, figs. 10*).—The author describes three types of white in cattle, all of which have colored ears and noses. One is the white of Shorthorns, which is incompletely dominant to color, and the others are due to extreme reduction in the amount of color in colored and white cattle and in colored cattle characterized by the speckling of color on a white background.

More about "albino" cattle (*Wisconsin Sta. Bul. 410 (1930), pp. 59, 60, fig. 1*).—In this report of a continuation of the study, by L. J. Cole, of albino cattle (E. S. R., 61, p. 123) a description is given of albinos which have been observed in several herds. It appears that the albinistic characteristic is due to a genetic factor causing extreme dilution of black pigment. This is based on the interpretation that a faint creamy color noticed in a portion of the coat of some of the albino cattle represents black pigment.

"Porcupine" pigeons provide interesting inheritance study (*Wisconsin Sta. Bul. 410 (1930), pp. 60, 61, fig. 1*).—An unusual mutant in pigeons, designated as porcupine, is described. In these birds the feathers were nearly devoid of web. This character is inherited as a simple Mendelian recessive to normal.

The behavior of mammalian spermatozoa between mating and fertilization [trans. title], **E. Redenz** (*Ztschr. Wiss. Biol., Abt. B, Ztschr. Zellforsch. u. Mikros. Anat., 9 (1929), No. 4, pp. 734–749, figs. 9*).—In studies with bats, the author reports that mating occurred in the fall when the testicles of the male showed active spermatogenesis, but the sperm lay dormant in the female until spring when ovulation occurred in the female. At that time active spermatogenesis was not observed in the testicles and the seminal vesicles were empty. Plates showing the arrangement of the spermatozoa in the tubules of the testicles at mating time and in the uterus of the females during the resting period are included.

On the biological significance of corpus luteum of ovary, Y. Miyagawa and K. Saito (*Japan. Jour. Expt. Med., 7 (1929), No. 2, pp. 145–156*).—Studies of the influence of the corpus luteum hormone showed that extracts of the corpus luteum of pregnancy produced the characteristic changes associated with pregnancy in the uterus, vagina, and mammary glands. The endocrine glands also showed changes characteristic of pregnancy as a result of the hormone administration. Fetal and placental hormones induced some changes common to those resulting from pregnancy, but the menstrual corpus luteum, matured follicular fluid, interstitial tissue of the ovary, and uterine mucosa had no influence on the production of the changes characteristic of pregnancy. The hormone of the pregnant corpus luteum was soluble in alcohol, ether, and water.

Compensatory hypertrophy of the untreated ovary after unilateral X-ray sterilisation, F. W. R. Brambell and A. S. Parkes (*Roy. Soc. [London], Proc., Ser. B, 105 (1929), No. B 734, pp. 36–42, fig. 1*).—Data are reported on the size and characteristics of the uninjured left ovaries in 40 female rats which were so treated with X-rays at three to four weeks of age that the right ovaries were rendered sterile. The average weight of pairs of normal ovaries was found to be 10.22±0.90 mg., while the average weight of the left ovaries in animals in which the right had been sterilized was 11.02±0.41 mg., showing practically complete compensatory hypertrophy. The litter size of normal females was 6.70±0.15 and of unilaterally sterilized females 5.55±0.20, further confirming the hypertrophy.

The ovarian hormone content of pregnant cow's urine, C. W. Nibler and C. W. Turner (*Jour. Dairy Sci., 12 (1929), No. 6, pp. 491–506, figs. 4*).—In these studies at the Missouri Experiment Station a method of extracting the ovarian hormone from urine by the addition of olive oil was tested and found satisfactory. Other experiments showed that the amount of ovarian hormone present in the urine was independent of the amount of urine excreted. Analysis of the hormone content of the urine of cows in different stages of gestation showed that open cows secreted no hormone except at oestrum; during the first 100 days of gestation small amounts were produced varying from 12 to 81 rat units per day; and after 100 days of gestation there was a rapid increase in the hormone excreted, reaching as much as 1,055 rat units in 24 hours by one animal. The increase was at the rate of 3.5 to 4 rat units per day as gestation advanced. When the oil extracts of the urine were fractionated with 95 per cent ethyl alcohol the hormone potency was increased about 125 per cent. This is taken to indicate the presence of a substance in the urine with an inhibitory effect on the oestrum-producing hormone which is not present in the alcohol fractions. It is suggested that this substance may be responsible for maintaining the anoestrous condition in the pregnant animal.

An ingenious method for the collection of urine samples from cows at will is described.

Oestrus and pseudo-pregnancy in the ferret, J. Hammond and F. H. A. Marshall (*Roy. Soc.* [*London*], *Proc., Ser. B, 105* (*1930*), *No. B 740, pp. 607–630, pls. 7, fig. 1*).—In studies of the reproductive cycle in the ferret, it was found that the anoestrous period extended from about August to March, April, or May. The oestrous period occupied the remainder of the year, unless there was coitus, which was followed by ovulation. The gestation period was found to be about 42 days. Cases of pseudopregnancy resulting from matings with vasectomized males lasted from 5.5 to 6 weeks, as determined from the appearance of the uterus and size of corpora lutea.

The vulva increases about 50 times in size during oestrum as compared with the normal anoestrous vulva, but is reduced in size during pregnancy or pseudopregnancy. The successive stages in the relative size of the vulva of different individuals from drawings on glass are included.

Studies of the ovaries of animals killed at different times indicated that the follicles are small during anoestrum, pregnancy, and pseudopregnancy, but during oestrum they enlarge, come to the surface, and remain there. If there is coitus, ovulation occurs with the subsequent development of the corpus luteum, and during pregnancy the ovary is largely filled with lutein tissue.

The anoestrous uterus is small, thin, and anemic, the mucosa dense and without folds. During oestrum the uterus increases in size and the lower layer of the glands develops, forming folds. There is further development of the folds during pseudopregnancy and pregnancy, together with hypertrophy of the surface glands, forming the plasmodial layer, which breaks down at about 5.5 weeks and is cast off just before parturition. The mammary gland hypertrophy is similar during pregnancy and pseudopregnancy, which appears to be entirely associated with the presence of the corpus luteum. A series of plates shows the histological changes in the uterus and mammary gland at different intervals in the cycle.

Rate of intra-uterine and postnatal development of opossum (*Carnegie Inst. Wash. Yearbook 28* (*1928–29*), *pp. 6, 7, fig. 1*).—By removing one cornu and one Fallopian tube and later the other half of the uterus from opossums at different stages of the gestation period and studying the size and character of the developing embryos present, C. G. Hartman found that the first cleavage of the ovum required about 2.25 days with succeeding cell divisions at 0.25 day intervals. The bilaminar blastocyst appeared at 6.5 days, and at 7.5 days the germ disk was established with a primitive streak and beginning notochord. Only 5.5 days thus remained for the development of the fetus to a stage capable of pouch life.

Unisexual progenies and the sex chromosome mechanism in Sciara, C. W. Metz and M. L. Schmuck (*Natl. Acad. Sci. Proc., 15* (*1929*), *No. 12, pp. 863–866*).—Studies of the inheritance of two sex-linked mutations, swollen and narrow, in *S. coprophila* have led to the formulation of the following hypothesis for sex determination: Females are XX and males XY. There are two kinds of X chromosomes, one being designated as X′ and limited to females. Female-producing females are X′X and male-producing females XX. As X′ chromosomes carry the normal allelomorphs of the mutations in the X chromosomes, the two kinds of X chromosomes are considered as fundamentally the same.

Further studies on the chromosome mechanism responsible for unisexual progenies in Sciara.—Tests of "exceptional" males, C. W. Metz and M. L. Schmuck (*Natl. Acad. Sci. Proc., 15 (1929), No. 12, pp. 867–870*).—Further studies of the behavior of the X and X′ chromosomes referred to in the above article indicated that either might be combined with the Y chromosome without influence on the external anatomy, vitality, or fertility of the male.

Sex determination in Sciara, C. W. Metz (*Amer. Nat., 63 (1929), No. 689, pp. 487–496*).—A review of sex determination in Sciara, based mainly on data previously noted (E. S. R., 62, p. 512).

FIELD CROPS

[Field crops experiments at the Raymond, Miss., Substation, 1929], H. F. Wallace and J. L. Cooley, jr. (*Mississippi Sta. Bul. 271 (1929), pp. 3–13, 15–21, 34, 36, 37*).—Continued agronomic experiments (E. S. R., 61, p. 432) reviewed for the year included variety trials with cotton on hill and valley land, corn, oats, potatoes (strains), soybeans, winter legumes to precede cotton, and miscellaneous forage crops; fertilizer tests with cotton, including comparisons of formulas, home v. factory mixed, and carriers of nitrogen, phosphorus, and potassium, and with corn; and spacing tests and seed treatment with cotton and an interplanting test with corn and legumes. Practices suitable for best results with crop rotations, winter and summer legumes, and pastures are discussed briefly.

Report of Holly Springs Branch Experiment Station, 1929, C. T. Ames and O. B. Casanova (*Mississippi Sta. Bul. 272 (1929), pp. 23, figs. 2*).—Agronomic investigations (E. S. R., 61, p. 433) reviewed for 1929, and in some cases for periods of several years, embraced varietal comparisons with cotton, corn, and soybeans; fertilizer tests with cotton on hill and valley land and comparing sources of nitrogen, potassium, and phosphorus, and formulas, and with corn and sweetpotatoes; spacing tests with cotton; and interplanting of corn and beans. As usual, practical suggestions are given for growing the crops mentioned above, and silage, vetch, field pea, alfalfa, and pasture, and for dairy farming.

Preliminary report of the Holly Springs Branch Experiment Station for 1929, C. T. Ames and O. B. Casanova (*Mississippi Sta. Circ. 87 (1929), pp. 5*).—The tabulated results of the variety and fertilizer tests with cotton, described above in greater detail, are set forth, with fertilizer recommendations for cotton on hill and valley land.

[Field crops experiments at the South Mississippi Substation], W. R. Perkins, W. S. Anderson, and W. W. Welborn (*Mississippi Sta. Bul. 274 (1929), pp. 4–9, 14–26, 27, 28, 31, 32, 33, figs. 3*).—Field crops investigations reported on for 1929 closely resembled those of 1928 (E. S. R., 61, p. 433) and included variety trials with cotton, corn, sugarcane, soybeans, and winter legumes; fertilizer tests with corn, oats, sweetpotatoes, and potatoes; trials of winter cover crops; and improvement work with sweetpotatoes. Cotton fertilizer experiments were concerned with carriers of nitrogen, phosphorus, and potassium, rates of application, home v. factory mixed, and comparisons of formulas.

[Field crops experiments in Ohio], R. M. SALTER ET AL. (*Ohio Sta. Bul. 446 (1930), pp. 20–52, 56–58, 110, 111, 112, 177, 178, 179–185, figs. 10*).—In experiments begun in 1929 near Dayton on bluegrass sod to determine the value of the Hohenheim system (E. S. R., 61, p. 434) for the grazing of beef cattle, data for the grazing period, May 14 to October 30, showed a gain of 179.5 lbs. of beef per acre on an undivided 10-acre field treated at 10-day intervals with sodium nitrate totaling 450 lbs. per acre, 175 lbs. on a treated field divided into paddocks, and 98 lbs. per acre on the unnitrated pasture. No apparent advantage came from dividing the pasture into paddocks grazed in rotation. Cage harvests showed the total production of dry forage for the season to average 2,800 lbs. per acre on the nitrated fields and 1,904 lbs. on the unnitrated field, and crude protein to average 432 and 269 lbs., respectively.

Timothy on Canfield silt loam did not make a material increase where treated with superphosphate alone or combined with potassium chloride, whereas sodium nitrate always gave an increase, the gain from the increments being roughly in geometrical progression. As was observed elsewhere in the State, these results indicated a high response of timothy to fertilizers containing plenty of readily available nitrogen.

Corn, oats, and wheat were grown during 10 years at Columbus in 4-year rotations with different hay crops, including clovers, sweetclover, alfalfa, and timothy. With the hay removed, corn yields after each legume except sweetclover were lower than after timothy. Oats yields after corn were irregular, due in part to lodging, while those of wheat were consistently higher on the legume plats. Where the hay was plowed under, corn always yielded more after the legumes than after timothy, especially after alfalfa and sweetclover. Oats yields always were depressed on the legume plats by lodging, induced by too much nitrogen on the naturally rich soil. Wheat yields were increased materially by the residues from alfalfa and sweetclover but not affected significantly by other residues. Plowing the hay crop under increased the yield of corn materially in all cases, but, with three exceptions, depressed the yields of wheat and oats.

In breeding varieties of corn resistant to the European corn borer, crosses between inbred lines were found more satisfactory than inbred lines because of their greater vigor, yield, and uniformity. The inbred lines with their reduced vigor remained practically uninfested, even when normal corn was quite highly infested. Based on number of eggs found, the attractiveness of the plats to the moths was closely associated with the height of the plants during moth flight. The earlier crosses tended to be slightly higher during early growth and somewhat more eggs were deposited on them, and the actual survival from a given number of eggs was higher on the early crosses. The increment of change in the rate of survival for each difference of one day in date of silking amounted to 5.2 per cent of the average survival rate. Since the mortality occurs during the growth and feeding of the larvae, the lower populations result in reduced damage to the crop as well as fewer borers in the crop residues. Three of the highest yielding crosses carried less than half the predicted population and were adapted to Ohio conditions.

In planting tests with corn during 20 years the maximum yield of dry shelled corn was obtained from the middate May 7 plantings, whereas the crop quality was lower and the stover yields increased as the planting date became later. The total weight of corn and stover increased until the middate of May 27 and decreased thereafter. The stover-grain ratio was a minimum on the middate of May 7, increasing rapidly thereafter as the date of planting became later. The killing frost dates and the length of growing season appeared to be of significance in regard to planting dates.

Corn was harvested in each of four years on six different dates beginning at the early dough stage and at weekly intervals thereafter. The yield of shelled grain and the test weight per bushel rose with each week's delay in harvest. Stover yields increased rapidly from the early dough stage of the ears until the dough stage and changed little from then on.

Although great differences in buffer action and pH values between different parts of the same plant of a single variety of corn were observed in physiological studies in connection with the European corn borer research program, no such differences were found between Medina Pride, a sort usually quite heavily infested, and Burr-Leaming, a corn somewhat resistant to infestation. Evidently the differences in borer infestations noted between these varieties could not be explained on that basis.

In the maturing cornstalk the percentage of dry matter increased progressively from the lowest point of the stalk up to the tassel, and in the cornstalk as a whole increased gradually from tasseling to maturity. The percentage of reducing sugars decreased from the lower to the upper part of the stalk and from tasseling to maturity in the stalk as a whole, whereas the reverse held for the sucrose percentage. The lower four sections (internode and node above) contained more than half of the total quantity of dry matter and sugars in the entire stalk. It seemed possible that the tendency for the corn borer larvae to move into the lower part of the stalk may be in response to this concentration of food material.

A definite correspondence was observed between the height of cutting the nurse-crop oats and the yields of white sweetclover hay and roots in the fall, and the value for soil improvement in the spring was directly proportional to the weight of roots the preceding fall. It was evident that the nurse crop should be cut high. Cutting with a mowing machine is said to be particularly unfavorable. Clipping with a hand sickle to simulate the action of a stripped binder was a severe check to the sweetclover, especially with the later clippings. It appeared that in Ohio clipping sweetclover usually decreases the seed yield, and, if done at all, should be early and high.

When lawns were variously treated for maintenance with ammonium sulfate and complete fertilizer and clippings removed from all but one plat, the results suggested one application in the spring of a complete fertilizer, as 10–6–4, at the rate of 10 or 12 lbs. per 1,000 sq. ft. supplemented later with two or more dressings of a nitrogen carrier, the frequency and rate depending upon the soil fertility. Delayed applications should be well watered to prevent burning. Further benefit might be derived from returning the clippings.

Canada thistle (E. S. R., 61, p. 640; 62, p. 136) mowed first on June 1, a time when organic food reserves in the rootstocks usually are lowest, and several times later was decidedly reduced in stand, and after several years of cutting practically all was gone from plats cut monthly four times, commencing June 1. Mowing, however, has not resulted in complete eradication of thistles on any plat. On the Miami County farm Canada thistles were not eradicated by a single spraying in June or other summer month with sodium chlorate, although a complete kill was obtained where thistles were sprayed in June and again in October or in the following April.

Seed potatoes either greened or warmed before planting to hasten germination gave better stands and stronger plants than seed direct from cool storage. The latter being slow to germinate rotted in the soil before the plants were large enough to grow independently. Similar results were had in a study of different storage temperatures, i. e., the yields increased with the warmer storage. In certain seasons, warming seed potatoes before planting seemed to be decidedly advantageous. On acid soil several plats were limed at different rates and planted to a rotation of potatoes and soybeans. The soybeans were larger on limed than acid soil and consequently furnished more organic matter. In both 1928 and 1929 limed plats produced the highest yields, attributable to the larger growth of soybeans plowed under before the potatoes. Moderate liming did not affect detrimentally either the yield or quality of the potatoes.

Other agronomic activities reported on as heretofore (E. S. R., 61, p. 433) included tests of the spring application of nitrogen, rate of planting, and improvement work with wheat; residual phosphorus in soils; corn breeding; varietal trials of alfalfa, red clover, and summer annuals for forage; and at Columbus the effects of nitrogen on yields and protein content of pasture grasses. Work at the county and regional experiment farms dealt with fertility rotation with wheat on clover sod, tobacco grown continuously and in rotation, corn production on tile-drained soil, and trials of varieties of corn, oats, barley, and wheat, potatoes, soybeans, red clover, sweetclover, lespedeza, and miscellaneous legumes.

[Agronomic studies in South Dakota] (*South Dakota Sta. Rpt. 1929, pp. 6, 7–9*).—Turkey wheat, Richland oats, and Bison flax were among the varietal leaders. Wheat continuous averaged 8.9 bu. per acre, after corn 16.4, and after corn followed by a legume, 20.7 bu. Quack grass was killed by smothering and fallow. Applications of spent oil up to 2,000 gal. per acre and calcium cyanamide up to 3,000 lbs. failed to eradicate bindweed. The principal purpose of plowing seemed to be that of killing weeds.

The total sugar in the leaves of early and late varieties of corn began to increase before 4 and 7 a. m., reaching a maximum usually about 1 p. m., whereas starch in the leaves appeared to decrease rather rapidly from 4 a. m. and to reach a minimum about 1 p. m. The early strain of corn had a relatively higher total sugar content than the later strain.

[Field crops investigations in Wisconsin, 1928–29] (*Wisconsin Sta. Bul. 410 (1930), pp. 13–16, 43, 44, 84–101, figs. 14*).—The agronomic experiments reported on continued previous work (E. S. R., 61, p. 127).

Nitrogen applications exceeding that in 150 lbs. per acre of a 2–12–12 fertilizer were found by G. E. Helz, A. L. Whiting, and I. L. Baldwin to decrease greatly nodule formation in soybeans. Nitrogen as cyanamide injured nodule formation somewhat less than other nitrogen forms tested. Ordinary phosphorus and potassium fertilizers increased nodulation when used in quantities not depressing seed germination, although more than 300 lbs. of a 0–12–12 fertilizer may lower germination and nodulation, particularly in a dry season.

E. McCoy observed that bacteria entered the bean plant through the root hairs by way of infection threads which are multiple and branch through the outer cortical cells of the root, stimulating the infected cells to divide and multiply, and so the wall of the nodule is formed. Bean nodules were found to contain an unusually large deposit of starch which remains until toward the end of the life of the nodule, when it begins to disappear. The starch is gone before the tissues show other signs of degeneration.

Only slight differences were evident in the electric charge carried by various strains of legume nodule bacteria, and these variations were not correlated with the ability of particular strains to fix nitrogen, according to F. Zucker, Baldwin, and E. B. Fred. Confirming earlier results, Baldwin and Fred found many strains of nodule bacteria, termed parasitic, which did not stimulate plant growth, although forming nodules. Six strains isolated from native wild peas and vetches proved parasitic with the common garden pea. Repeated passage of the nodule bacteria from plant to plant in studies by O. N. Allen seemed to have no uniform effect. Such plant passage seemed to increase the ability of a parasitic strain to fix nitrogen, while the opposite effect has been noted often with so-called good strains. The parasitic strains may be poor only because they can not cause nitrogen fixation.

The number of nodules on the legume appear to be related inversely to the nitrogen nutrition of the plant, according to D. H. Dunham and Baldwin. Single plants may bear nodules formed by two or more strains of bacteria. A plant already well nodulated was more difficult to infect than an uninoculated plant. However, it was impossible to demonstrate the presence of agglutinins in the plant. Simultaneous inoculation of a legume seed with both good and parasitic strains resulted in the formation of nodules by both strains of the organism. Plant growth was better than if inoculated with the poor strain only but not equal to that produced by inoculation with the good strain.

Noteworthy crop improvements included Havana No. 142, a black root-rot resistant type of tobacco; State Pride (Wisconsin Pedigree 7), an early yellow oats; Pedigree 5 rye, high yielding and characterized by uniform light colored kernels; Ferramington hemp; high quality wilt-resistant selections of the Alaska canning pea; and Pedigree 37 and 38 barleys.

The bin drier, developed for the drying of seed of field corn by A. H. Wright and F. W. Duffee, proved highly efficient for drying seed of other types of corn. Wright demonstrated that, regardless of the initial moisture content or the degree to which pop corn is dried, it is not damaged for seed purposes by the rapidity of the process in this method. Rapid drying also did not impair popping value. Commercial trials showed that sweet corn could be dried as effectively in a bin drier as field corn. Rapidly dried sweet corn was equal in germination and appearance to that dried by former methods.

Permanent pastures in the State impoverished by the removal of plant nutrients in milk, meat, bone, and manure, according to G. B. Mortimer and G. Richards respond to treatment with phosphorus and potassium both in heavier production and in botanical composition of the forage. Some land was so depleted that repeated applications were required for significant yield increases. Nitrogenous fertilizers often were unprofitable and were ineffective on pastures low in phosphorus, potassium, or calcium. Reseeding permanent pastures with suitable legumes often facilitated recovery of production. Except on heavy turf, disking pasture plants before reseeding did not improve greatly the catch of the clovers planted.

Cutting bluegrass early and often, according to tests by L. F. Graber, depresses organic reserves in the roots necessary for satisfactory growth in the following year. Heavy fertilizer treatments were a corrective for too close or early cutting or grazing but might not be economical. Likewise, bluegrass for lawns cut 0.5 in. above the soil surface contained more weeds and was much sparser and weaker than on areas cut 1.5 in. from the ground.

Further evidence was gained by Graber to support the recommendation to Wisconsin farmers that alfalfa be cut twice a year rather than oftener, based on the observed relationship between frequent cutting and winterkilling and now proved to be closely correlated with low organic reserves. No important difference between grain varieties as to their effect as a nurse crop for alfalfa was found by E. J. Delwiche. Oats at the rate of 1 bu. per acre did not differ from 1.5 and 2.25 bu. although more than 3 bu. were injurious to alfalfa seedings. Alfalfa without a nurse crop did not yield more hay the next year than that planted with a nurse crop. Seeding tests with oats suggested that heavier acre rates, as 2 or 3 bu., may be more profitable, although on the sandy soils the lighter rates were often most productive.

Improvement of sagebrush range in Colorado, H. C. HANSON (*Colorado Sta. Bul. 356 (1929), pp. 12, figs. 9*).—Burned or grubbed sagebrush land in an area of the Laramie River Valley in northern Colorado was either spring seeded to a grass mixture or fall seeded to brome grass and either protected from or exposed to rodents, and protected from grazing by livestock. See also an earlier note (E. S. R., 59, p. 34).

The stand of palatable and nutritious grasses greatly increased in the first year after the sagebrush was burned or grubbed out and increased even more in the second year. Natural revegetation by grasses already present was satisfactory, so that artificial reseeding was not needed. Rodents used up a considerable quantity of forage.

Burning, done in October, succeeded better than grubbing in destroying sagebrush, dense stands 3 ft. or higher being burned readily with a suitable wind. Burned areas evidently should be grazed only lightly before the seeds have matured the first two seasons after burning in order to give the grasses opportunity to grow. It appeared that the grasses could hold the sagebrush in check for a considerable time. On areas burned 5 to 10 years before observation the stand of grasses was still very good, even when heavily grazed by livestock and rodents.

Good practices increase yields of pasture, M. M. MCCOOL and M. D. WELDON (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 107–110*).—Fertilizer experiments with pasture, largely Kentucky bluegrass, on several soil types in southwestern Michigan showed the proper application of complete fertilizers to be profitable. Plowing and reseeding were quite effective in improving production where the stand was poor and the turf not well developed. Moderate grazing seemed to lead to greater production than close grazing. Occasional mowing appeared necessary to control weeds. The influence of fertilizers on the character of vegetation was illustrated on the Caledonia field, where the application of superphosphate increased the relative amount of clover in the herbage, while nitrogen fertilizer decreased it.

Legumes as a source of available nitrogen in crop rotations, T. L. LYON (*New York Cornell Sta. Bul. 500 (1930), pp. 22, figs. 13*).—The effects of certain legumes and their place in the rotation on the yields of all the crops in a number of 5-year rotations are described from data covering 10 years, or two rounds, of the rotation, although conclusions were drawn largely from the second round, considered a better measure of the results of continuous practice of the rotation.

Where alfalfa and timothy were each followed by cereals through several years, while alfalfa activated the soil nitrogen causing larger yields of the cereals immediately following, the activity declined with the succeeding crops, and yields following the alfalfa and the timothy tended to become equal in the course of several years. Similar results were had when cereals were compared following red clover and timothy. It appeared advisable to repeat the legume in the rotation at intervals short enough to prevent nitrogen from losing its activity at any time. Considering soil fertility, seeding to timothy oftener than every four or five years probably would not be desirable, since timothy apparently stimulates soil nitrogen less than does alfalfa.

Holding an alfalfa or a timothy meadow for two and three years, respectively, did not result in larger crops of cereals in the two years following the sod turned under than did keeping the meadow only for one year. Red clover spring sown as a catch crop in a stand of cereal and allowed to grow after the cereal harvest until plowing for the next crop gave a material gain in crop production as compared with a rotation similar except as to the clover.

The planting of peas with oats and vetch with wheat in a 5-year rotation produced a greater value of feed than when the grains were grown alone in the rotation. When red clover was in the rotation the advantage from the mixture was less than when timothy or a cereal replaced clover, probably because the soil was more in need of active nitrogen where the clover was not grown. Alfalfa receiving superphosphate and potassium chloride averaged 0.75 ton more hay per acre than where no fertilizer was used. The total production of dry matter and nitrogen in the crop was increased.

None of the highest yielding plats omitted alfalfa or clover from the rotation. The plats producing the most dry matter and nitrogen were the one having alfalfa continuously and the one with three years of alfalfa in the 5-year rotation. A rotation containing one year of red clover twice, but not continuously, in five years yielded about 2 tons more dry matter during the round than did a rotation with only one year of red clover.

Cotton variety tests, 1929, G. A. Hale and H. K. Brabham (*Georgia Sta. Circ. 87 (1930), pp. 3*).—Variety tests with cotton at the station and near Carnegie in Randolph County are reported for 1929. The Cleveland type cottons and similar varieties, such as Stoneville No. 2, D. & P. L. No. 8, College No. 1, and Burdette Acala, among the leaders in the trials, are considered well adapted for general planting in Georgia, except on wilt-infected lands of southwest Georgia, where the Toole, Lewis No. 63, Cook, Lightning Express, and Super Seven varieties may be planted.

Cotton varieties, 1929, J. F. O'Kelly and W. W. Hull (*Mississippi Sta. Circ. 88 (1929), pp. 5*).—Cotton varieties (E. S. R., 60, p. 734) leading in average acre yields of lint during the period 1925–1929 included D. & P. L. 4–8, Cleveland 54, Piedmont Cleveland, Half-and-Half, and Cook 1010, and according to acre value D. & P. L. 4–8, Delfos 911, Deltatype Webber, Cleveland 54, and Express. D. & P. L. 6, Miller 5111, Lone Star 284, and Cleveland 54 led in value the varieties compared in 1929. Four strains of Miller, Cleveland 54, and Lightning Express led similarly in trials for wilt resistance.

Cotton variety experiments at Substation No. 2, Troup, W. S. Hotchkiss and P. R. Johnson (*Texas Sta. Bul. 406 (1930), pp. 31*).—Varietal trials at the Troup Substation during the period 1913–1928, involving 205 sorts of cotton, showed the leaders in average acre yields of lint to include Half-and-Half with 300 lbs., New Boykin 258, Kasch 257, Mebane (804) 255, and Harper 252 lbs. Half-and-Half had small bolls, a lint percentage of 41.9, and a staple ¾ in. long, whereas the other four cottons, all derived from the Mebane or Triumph type of cotton, had relatively large bolls, staple averaging 15/16 to 1 in., and lint percentage ranging from 36 to 39. On the local market Half-and-Half was the most profitable variety grown, having an average acre value of $47.60, compared with New Boykin $41.08, Kasch $40.87, Mebane 804 $40.65, and Harper $40.06. Based on central market prices, where premiums are paid for staple cotton, there was no significant difference in the money value per acre of Half-and-Half, New Boykin, and Kasch, the respective values being $46.31, $45.96, and $45.73.

The results are considered probably applicable to most of the soils in the northeastern part of Texas.

Three new varieties of lespedeza, S. H. Essary (*Tennessee Sta. Circ. 30 (1930), pp. 3*).—The characteristics, comparative yields of hay and seed, and the adaptations of the Tennessee No. 76 and Kobe (both *Lespedeza striata*) and Korean (*L. stipulacea*) varieties of lespedeza are summarized. Tennessee No. 76 seems best suited to elevations under 1,200 ft. and Kobe to elevations of

1,200 to 1,800, while Korean for hay and pasture is advised for elevations of 2,000 ft. or higher.

Ideal types for Colorado standard potato varieties, C. H. METZGER (*Colorado Sta. Bul. 359 (1930), pp. 23, figs. 16*).—Varietal types, i. e., the shape or form of the tuber, the color and texture of the skin, and the location, number, and depth of the eyes; the measurements of perfect types; and common faults are described for the Irish Cobbler, Bliss Triumph, Early Ohio, Russet Burbank, Brown Beauty, Peachblow, Rural, and Peoples Russet potatoes, and producing districts are indicated. Production tendencies and the effects of disease and environment are commented on and advice given on picking the show sample and judging.

Straw mulch for early potatoes, J. BUSHNELL and W. E. WEAVER (*Ohio Sta. Bimo. Bul. 143 (1930), pp. 35–37*).—Early potatoes at the Hamilton County Experiment Farm, mulched at the rate of 10 tons of straw per acre, at planting, averaged 17 bu. more than the untreated check, mulched when plants were up 61 bu. more, and mulched when 12 in. high 36.5 bu. more. The increases obtained, particularly from the second date of application, suggest that mulching may prove practical on a commercial scale if straw is available at a reasonable value. The saving in labor of cultivation is largely offset by the work of applying and removing the straw. Soil type and normal temperatures also are factors to be considered.

It was found at Wooster that less than 10 tons would not keep down ordinary annual weeds, so that at least that amount should be used to insure all benefits of the mulch. Even 10 tons did not suppress perennial weeds, such as thistle and morning-glory.

Value of potato sprays and dusts tested, E. J. WHEELER and H. C. MOORE (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 92–94*).—Spraying and dusting experiments at Augusta and Lake City showed potatoes sprayed with Bordeaux mixture to outyield decidedly those dusted with copper-lime dust, which in turn averaged better than untreated plats. Yields from hand-dusted and power-dusted plats did not differ significantly, and home-mixed dust was as satisfactory as and cheaper than commercial mixed dust.

I, Factors in Soybean production. II, Variety recommendations and characteristics, P. H. KIME (*North Carolina Sta. Agron. Inform. Circ. 49 (1930), pp. 6*).—Cultural and field practices are outlined for growing soybeans for hay, pasture, and seed, and varieties described are recommended for seed, hay, pasture, and for planting in corn for the Coastal Plain, Piedmont, and mountain sections of North Carolina.

Cultural experiments with soybeans for silage and for hay, T. E. ODLAND (*West Virginia Sta. Bul. 227 (1930), pp. 24, figs. 4*).—Soybeans and corn were grown separately and in combinations for silage, and soybeans were also grown for hay alone in planting tests and in combination with Sudan grass, sorghum, and millet during the period 1921–1925.

Grown with corn for silage soybeans did not increase the total yield per acre over corn alone at the same planting rate, and the yield of shelled corn was reduced from 6 to 8 bu. per acre. Soybeans made up from 9.3 to 15.4 per cent of the total green weight in the several corn-soybean combinations. While the percentage of protein in the silage and the acre yield of protein was increased when soybeans were grown with the corn, the yield of total nutrients per acre was not greater. The increase obtained in protein per acre was not enough to compensate for the extra work in growing the combination. Neither crop affected the protein content of the other.

Grown alone soybeans yielded practically the same whether in cultivated rows or sown solid, although the crop in the cultivated rows had the higher protein content. Planted at the rates of 6 and 8 pk. per acre, soybeans produced a finer quality of hay which was more nearly weed-free than from the rates of 4 or 5 pk., although yields did not differ much. From May 15 to June 15 appeared to be the optimum period for planting for hay. Sudan grass and soybeans was the most desirable mixture for hay.

Soybeans for Oklahoma, B. F. KILTZ (*Oklahoma Sta. Circ. 77 (1930), pp. 14*).—Information is given on the adaptation of soybeans, varieties and their hay and seed yields, cultural methods and field practices, inoculation (E. S. R., 60. p. 332), harvesting for hay and seed, uses of the crop, and experience with the crop on outlying fields and in different counties of Oklahoma.

Fertilizing timothy meadows with nitrate of soda, M. W. EVANS (*Ohio Sta. Bimo. Bul. 143 (1930), pp. 44–49, fig. 1*).—Fertilizer experiments at the timothy breeding station in cooperation with the U. S. Department of Agriculture during the period 1918–1927 demonstrated that hay yields in timothy meadows may be increased by the use of farm manure or by properly selected commercial fertilizers. Sodium nitrate was effective, especially if used in combination with superphosphate, when the ingredients supplied in the fertilizer more nearly replaced those removed by the crop. The hay yields were increased further by the addition of potassium chloride, but due to the relatively high cost of this material the application on timothy meadows was hardly practical. Application of from 100 to 150 lbs. of sodium nitrate in combination with from 100 to 250 lbs. of superphosphate per acre is suggested for most conditions under which timothy meadows are to be fertilized. Application of fertilizers at the current price on meadows used for the production of timothy hay for market at $12 or less per ton did not appear practical.

Rotation and the tobacco crop, J. JOHNSON and W. B. OGDEN (*Wisconsin Sta. Bul. 412 (1930), pp. 24, figs. 13*).—The relative merits and demerits of crop rotations and continuous culture for tobacco are described from experiments in Wisconsin, cooperative with the U. S. D. A. Tobacco Investigations, and elsewhere.

With special reference to Wisconsin conditions, it appeared that the sod crops are most likely to be injurious to succeeding crops of tobacco, timothy sod seeming the most commonly injurious. Alfalfa sod is often risky, and even clover sod may sometimes injure crop prospects. The probability of harm increases with the age of the sod, although even one year in these crops may be harmful at times. When these sods are allowed to go into pasture for several years and such plants as bluegrass become established, the injurious effect may still persist. Tobacco after tobacco in continuous culture has averaged close to the highest yield in the trials. Different soils have yielded strikingly different results, as crops injurious on some fields are beneficial on others. An intensive study of the systems of tobacco culture indicated that, if rotation is practiced, brown root rot is likely to result and, if rotation is not practiced, black root rot may develop. The use of strains resistant to black root rot in a continuous culture system naturally solves both of these difficulties at the same time.

Marsh cress, a bad weed, L. H. PAMMEL, C. M. KING, and A. HAYDEN (*Iowa Sta. Circ. 120 (1929), pp. 8, figs. 4*).—Marsh cress (*Radicula palustris*) is described as a weed abundant in oats and corn, especially in northern Iowa in low or flat areas, being favored by long wet seasons. Its distribution is discussed in some detail. Since the weed has been worst in oats following corn, it is recommended that when much marsh cress is present corn stubble should be plowed or disked thoroughly before oats are seeded. The corn should be kept clean and at the last cultivation planted to soybeans or other legumes. As with charlock and other mustards, late fall and early spring cultivation is effective. March cress can also be checked by application of iron sulfate in the proportion of 100 lbs. to a barrel of water.

Wild garlic control in Illinois, J. J. Rieper and L. F. Rickey (*Illinois Sta. Circ. 353 (1930), pp. 15, figs. 10*).—Wild garlic (*Allium vineale*), a serious weed in the wheat areas in the southern half of Illinois, is becoming more serious in infested areas and is spreading farther north. Garlicky wheat from the infested areas has been subject to heavy discount at the St. Louis market. The characterictics of wild garlic and wild onion (*A. canadense*) are described, and control methods are outlined.

Essentials of the cultural method of control held most effective include plowing the land in the fall, November 1 or later, and again in the spring, before April 1. The success of the cultivation plan for eradication depends upon the wild garlic plants being completely covered in the plowing operations. The planting of infested fields to a cultivated crop is a further aid in eradicating wild garlic. After a program of control and eradication has been started, reinfestation of the farm must be prevented.

Chlorate applied to foliage is most effective, C. R. Megee and W. H. Daugherty (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 91, 92*).—Application of sodium chlorate solution (in two treatments) to different plant parts of quack grass, Bermuda grass, corn, and beans grown in pots demonstrated that chlorate applied to the foliage is more effective than when applied to the stem, at the base of the plant, or through the bottom of the pot.

Residual chlorates soon lost from soil, C. R. Megee and R. W. Lipscomb (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 84–87*).—Chlorates were applied to land as weed killers at different times in the year and on different cultural treatments, and the effects on crops planted at various times thereafter and the residual influence at various depths were determined. From the behavior and yields of the crops following it was evident that chlorates applied in late summer and fall are not likely to influence crop production the next season. With chlorates applied during the spring, it did not appear feasible to attempt to grow crops during the summer of the same year, although the residual influence usually is dissipated enough by late September so that wheat and rye may be sown. Heavy applications of chlorates penetrated the soil much deeper than light applications, yet even light applications, 150 to 200 lbs. per acre, may penetrate deep enough to injure shallow rooted shrubs and trees. The authors concluded that deep rooted trees, as mature apple trees, are not likely to be injured by application of 300 lbs. of sodium chlorate per acre.

HORTICULTURE

[Horticulture at the Raymond, Miss., Substation], J. L. Cooley, jr. (*Mississippi Sta. Bul. 271 (1929), pp. 21–33, 35, 36*).—As the preceding report (E. S. R., 61, p. 438), this is concerned chiefly with the results of fertilizer and variety tests with vegetables.

Of 13 varieties of tomatoes tested Marvel, Globe, Norton, Richard, and Gulf States led in yield of marketable fruits. Globe and Gulf States produced the largest marketable fruits on an average basis. Foster, Globe, Marvel, Marglobe, and Louisiana Pink proved most resistant to bacterial wilt.

Comparing various formulas, it was noted that over a 4-year period a 5–8–3 (N–P–K) fertilizer was most effective in the 1,500-lb. per acre group and a

3–10–3 in the 2,000-lb. group. Over a 6-year period 4 per cent of potash in the formula proved most satisfactory, but it is pointed out that the proportion should be modified in relation to soil type. Potash evidently favored a stocky plant and better colored fruit. A combination of nitrate of soda, sulfate of ammonia, and of cottonseed meal proved a very satisfactory source of nitrogen. Comparing 1,000, 2,500, and 3,000 lbs. per acre of complete fertilizer with nitrogen derived from nitrate of soda, 2,500 lbs. gave the best results. Nitrate of soda proved an excellent side dressing, yielding in every case larger fruits on the average than were secured with ammonium sulfate. In a study of the effect of nitrogen and of potash on shipping quality all lots shipped satisfactorily to New York City. In a commercial test of various fertilizers for tomatoes the largest net profit was secured with 2,500 lbs. of a complete mixture with nitrogen from nitrate of soda. The largest tomatoes grew on the 3,000-lb. plat.

For garden peas a 3–10–3 formula was found very satisfactory, both in the 1,000-lb. and the 1,500-lb. groups. Nitrate of soda was the best source of nitrogen, as based on 6 years' tests. Among pea varieties World Record was the most productive in 1929.

For garden beans a 3–10–3 mixture was most beneficial in the 1,000-lb. per acre group and a 4–8–4 in the 1,500-lb. group. In 1929 a 6–8–4 gave the best yields. Nitrate of soda was the best source of nitrogen. Giant Stringless Green Pod was the most productive variety.

Comparing side dressings of 100, 200, 300, and 400 lbs. of nitrate of soda for watermelons, little effect was noted on size of melons, but total yield was materially increased with larger applications.

Trunk circumference records on pecan trees fertilized with complete fertilizer, nitrate of soda, and nothing showed some gain from the fertilizer, with no significant difference between the materials.

Report of horticultural work at South Mississippi Experiment Station, W. S. Anderson (*Mississippi Sta. Bul. 274 (1929), pp. 27, 28, 29, 30, 32, 33, 34*).—A progress report (E. S. R., 61, p. 438).

Continued work with blueberries consisted in the propagation of selected types and in a study of packages for shipment. Berries in ventilated cardboard cartons containing 12 ventilated pint baskets were shipped successfully to distant markets.

Using as a control 900 lbs. of a 4–8–4 fertilizer split into two applications and supplemented with 275 lbs. of nitrate of soda per acre as a side dressing, no material gains in strawberry yields were secured from any modification of the formula or from increased quantities; in fact, in many cases there were losses.

Data are presented on the time of ripening, flesh color, etc., of about 20 varieties of peaches. Among 30 varieties of apples only three, namely, Hackworth, Day, and Red Astrachan, were found worthy of growing. Some fruit was borne on Satsuma and Calamondin oranges, Meyer lemon, and Duncan grapefruit. Kumquats produced heavy crops. Celeste figs under straw mulch fruited more heavily and carried their foliage later than did clean cultivated trees.

For snap beans 1,350 lbs. of mixed fertilizer made up of 400 lbs. of nitrate of soda, 750 lbs. of superphosphate, and 200 lbs. of Trona potash gave the highest yields. Data are presented on the number of nuts per pound and the percentage of kernel for 9 varieties of pecans.

[Horticulture at the Ohio Station] (*Ohio Sta. Bul. 446 (1930), pp. 94–110, 178, 179, figs. 2*).—Again presenting (E. S. R., 61, p. 439) a progress report on activities, data assembled by J. H. Gourley are given on the results of fertilizer studies conducted near Vermilion with the grape. With two check plats averaging 5,877 lbs. per acre, horse manure gave the highest yield, 7,137 lbs., with sulfate of ammonia, 6,795 lbs., next.

Storage records on Grimes apples harvested from trees fertilized with different amounts of nitrogen applied at various times showed no definite association between fertilizer treatment and keeping quality. Analyses for total nitrogen showed larger quantities in apples from the nitrated plats. Catalase activity was also higher in the fruit of the nitrated trees. Respiration studies with young growing fruits gave negative results.

Yields presented by C. W. Ellenwood for 9 varieties of apples planted in 1893 show that apple trees under good care may be expected to attain maximum productivity between 35 and 40 years from planting.

Experiments conducted by F. H. Ballou showed but little difference between sprays and dusts as control for apple scab. The efficiency of the spraying equipment was found to be a potent factor in successful spraying, high powered outfits making possible the use of less concentrated materials.

Records taken by Ballou at the Clermont County Experiment Farm over a 7-year period showed the great value of nitrogen fertilizers for apples growing on relatively poor soil. No significant difference was noted between ammonium sulfate and nitrate of soda. As computed by Ballou from records taken in an orchard in Licking County, the average cost per bushel basket of apples packed for market is about 70 cts.

Further data obtained by F. S. Howlett on self and cross-pollination of apples are presented and show the general need of cross-pollination in different species. Thinning the fruit clusters of Grimes apples at an early stage, Howlett found that with only one fruit left per cluster 81 and 92 per cent of the fruits remained after the June drop in 1927 and 1928, respectively, as compared with 62.5 and 57 per cent in the two-fruit clusters.

The desirability of light pruning of young peach trees was established by J. S. Shoemaker in data taken on the growth and production of trees pruned to varying degrees. Size of fruit was not affected by pruning. The greatest frequency of shoots and the most fruits were on twigs from 4 to 12 in. long. Twigs over 0.5 in. in diameter were much less productive than were slender twigs.

Continued studies by Shoemaker on runner formation in the Premier strawberry showed the superiority of early rooted plants. Nitrogen was most effective when applied about the time of fruit bud formation. Applications of nitrogen in the spring of the fruiting year were not beneficial except by increasing size of berries in later pickings.

Studies by D. Comin of the growth of vegetable plants under glass and glass substitutes showed materially less development as measured by fresh weight and length under substitutes. Parsley was the only species tested to thrive under substitutes. The temperature of the soil and air was higher under glass, and the amount of light transmitted was much greater in the case of glass. As recorded by L. W. Sherman at the Mahoning County Experiment Farm ordinary glass was superior to substitutes as a cover for hotbeds used in producing vegetable plants. Cabbages started under glass produced more early and more total heads of heavier weight than did plants grown under substitutes.

Two new pink tomatoes, selections of Livingston Globe and of Marglobe, were developed by I. C. Hoffman for greenhouse use. The harmful effect of manure mulches upon greenhouse-grown tomatoes is pointed out by Hoffman, who also shows that the removal of healthy leaves from the base of tomato plants before the adjacent fruit has fully developed is a harmful practice.

Manganese sulfate broadcasted at the rate of 1 lb. per 435.6 sq. ft. was effective in restoring normal green color and normal growth to greenhouse tomatoes suffering from chlorosis.

In continuing the celery fertilizer experiment near Ravenna, Comin found nitrogen to be the most important limiting material. Ammonium sulfate was equally as effective as was nitrate of soda. Supplemental applications of commercial fertilizer were more beneficial than was stable manure in equivalent amounts.

[Horticulture at the South Dakota Station] (*South Dakota Sta. Rpt. 1929, pp. 24–27*).—Descriptions are given of several newly named apple, pear, and sand cherry seedlings which offer promise because of combined hardiness and quality.

[Horticultural investigations at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 38–40, 43, 55, 56, 59, fig. 1*).—Studies by W. E. Tottingham and J. G. Moore upon the chemical composition of plants grown under ordinary glass and under a glass substitute, Vitaglass, which allowed the passage of ultra-violet rays, showed a higher content of nitrogenous materials and a lower content of sugars in the plants under Vitaglass. Corn, tomatoes, and cabbage grown under Vitaglass lacked in hardiness, while wheat was not affected. However, in wheat, soybeans, and Coleus growth was suppressed under the Vitaglass.

Having discovered that the varieties of tomatoes which are strongly self-pollinating in winter possess pistils as short as or shorter than the stamens and that this relationship in certain varieties is affected by the length of day, E. F. Burk succeeded in developing by breeding and selection a strain of Bonny Best which possessed short pistils, even when grown in winter in the greenhouse. The new variety, combining the ability of winter setting with desirable qualities of the Bonny Best, is deemed highly promising.

The results of varietal tests with several vegetables are outlined by Moore and Burk.

As established by D. Bradbury and R. H. Roberts, the lack of sunlight during cold, wet weather is a more potent factor in reducing cherry set than is a lack of pollination. Shaded trees with abundant insect visitors set only 0.92 per cent, as compared with 18.72 per cent for adjacent unshaded trees. There was observed a distinct correlation between the length of annual growth and the set of fruit in the Early Richmond cherry.

As established by E. J. Renard, R. A. Brink, and R. A. Moore, rogues in canning peas appeared to be largely due to natural crossing of type plants with distinct forms. Some evidence was obtained that the percentage of crossing is higher in dry than in humid regions.

Pure line breeding conducted by G. H. Rieman and Brink, in cooperation with the U. S. Department of Agriculture, with onions showed the possibility of developing uniform strains. Inbreeding of onions reduced vigor in some strains but not in others.

The physiological effect of ethylene gas upon celery, tomatoes, and certain fruits, R. P. Hibbard (*Michigan Sta. Tech. Bul. 104 (1930), pp. 30, figs. 6*).—Studying the effects of ethylene from the viewpoint of color change, growth modification, and chemical change during the blanching process, the general conclusion is reached that for blanching celery, ethylene is of little practical importance under Michigan conditions. The optimum temperature range for effective blanching with ethylene was found very narrow and too high for use of the gas in the field in late autumn. Celery under boards increased nearly 75 per cent in length of heart leaves during blanching, as compared with little change in the ethylene-treated lot. Ethylene-blanched celery contained less total sugars in the heart and inner stalks than was found in control plants, a condition due apparently to accelerated respiration and a lack in the plant of an extensive carbohydrate reserve.

Comparable studies carried on with tomatoes, bananas, oranges, and apples are reviewed. In the case of green ripe tomatoes ethylene materially shortened the time required for coloration, but the sugar content was much lower than in vine-ripened fruits. Between detached tomatoes ripened in ethylene and in air there was no significant difference in total sugars.

Ethylene speeded up the yellowing of bananas, even when very green fruit was gassed, and also stimulated the reduction of starch and other reserves but had no beneficial effect on ultimate quality.

In the case of oranges, coloration was stimulated with little or no effect upon chemical composition.

McIntosh apples subjected to ethylene were not reddened, but the green ground color was changed to yellow, the author suggesting that ethylene has an effect on plastids but no apparent influence on anthocyanin pigments.

Radish seed fertilizer experiments reported, G. STARR (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 96–98*).—Of various fertilizers used singly or in combination upon radish plants grown for seed production, the complete mixtures were most valuable. Phosphorus used alone was highly beneficial, causing early development, profuse blooming, and heavy seed production. Nitrate of soda stimulated vegetative growth but did not correspondingly increase seed yields. Potassium had little effect on the production of seed.

Nitrogen fertilizers for tomato production, J. L. COOLEY, JR. (*Mississippi Sta. Bul. 273 (1930), pp. 12, fig. 1*).—Extended tests of nitrogenous fertilizers for the tomato are summarized and show that cottonseed meal supplemented with a side dressing of nitrate of soda was the most effective treatment for the spring crop and second best for the fall crop. A combined fertilizer with nitrogen consisting of equal parts of nitrate of soda, ammonium sulfate, and cottonseed meal gave second best results in both spring and fall. Nitrate of soda under the crop and as a side dressing gave the largest average sized fruits and ranked second in net returns in the side dressing tests. Nitrate of soda applied in a complete mixture used at the rate of 2,500 and 3,000 lbs. per acre was not harmful to shipping quality of tomatoes; in fact, the fruits from the heavy treatments shipped and kept better than those from lighter applications.

Quantitatively, the 2,500 lbs. per acre produced the largest net profit and largest fruits. Size of application had no apparent influence on the percentage of cracked or puffy tomatoes.

Development and ripening of peaches as correlated with physical characteristics, chemical composition, and histological structure of the fruit flesh.—III, Macrochemistry, G. T. NIGHTINGALE, R. M. ADDOMS, and M. A. BLAKE (*New Jersey Stas. Bul. 494 (1930), pp. 16, fig. 1*).—Analyzing the flesh and skin of peaches taken at various stages of development from two adjacent 7-year-old Elberta trees, one of which had been heavily fertilized with nitrogen for several years and the other without added nitrogen, for dry matter, acidity, and various carbohydrate and nitrogen components notable differences were found. Externally the trees were decidedly different, the high-nitrogen tree making 33,233 in. of twig growth in a single season, as compared with 5,828 in. for the low-nitrogen tree. Marked differences were also observed in the color of the fruit and foliage and in the time of maturity of the fruit.

Frequent readings on starch content of the twigs and older wood consistently showed more starch in the low-nitrogen tree, and in one determination upon current season growth (September 5) considerably more nitrogen on a percentage basis was found in the high-nitrogen tree. Protopectin decreased markedly in the fruits as they approached a soft ripe condition on the tree, but with no corresponding increase in soluble pectin. Cellulose and hemicellulose also decreased with maturity. The percentage of cellulose and protopectin was a little higher in the flesh of the fruits of the low-nitrogen than in those of the high-nitrogen tree.

Comparing Elberta peaches with a typical canning variety, Shipper Cling, it was observed that at the full ripe stage the Shipper Cling was over 100 per cent higher than Elberta in content of insoluble protopectin. Very young peach fruits were low in total sugars (mostly reducing sugars). At maturity the fruit of the low-nitrogen tree was very much higher in reducing sugars and sucrose than was the high-nitrogen tree fruit. At no time was there any significant difference in titrable acidity between the two lots of fruit. The flesh of the high-nitrogen tree fruits was throughout the entire series of analyses over 100 per cent higher in total nitrogen. No inorganic nitrogen was detected at any stage. Although there was a higher percentage of tannin in the green fruits of the low-nitrogen tree, the differences became insignificant in fruits of the soft ripe stage. Percentage of total ash was apparently high at all stages in fruit of the high-nitrogen tree.

The Van Fleet raspberry, J. A. McClintock (*Tennessee Sta. Circ. 29 (1930), pp. 4, figs. 4*).—Quite similar to an earlier contribution (E. S. R., 58, p. 336), this circular also presents information on culture, propagation, and utilization.

Three new grape varieties recommended, H. M. Wells (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 105, 106, fig. 1*).—Brief descriptions are given of three promising grapes, namely, Urbana light red, Toilkins light green, and Butler red.

Report from the Natchez Branch Experiment Station on pecan work to December, 1929, S. J. Greer and W. T. Mallory (*Mississippi Sta. Bul. 275 (1929), pp. 16, figs. 16*).—Opening with a brief outline of the history of the establishment of the branch station, which commenced active operations in October, 1928, and of proposed work, general instructions are presented with abundant illustrations upon whip, cleft, and bark grafting of pecans and upon budding, with notes on raising seedlings for propagation.

The production of lilly bulbs, D. Griffiths (*U. S. Dept. Agr. Circ. 102 (1930), pp. 56, figs. 44*).—Supplemented with botanical notes and information on breeding, control of pests, cultural aspects, and the marketing of flowers, a thoroughgoing discussion is presented on propagation of lilies, taking up in turn the various phases—seed, scale, stem, bulbil, and division methods. The habits of reproduction and the specific cultural requirements of the various lilies are discussed in detail, with suggestions as to the most desirable methods of treatment for each species.

Lawns in Florida, C. R. Enlow and W. E. Stokes (*Florida Sta. Bul. 209 (1929), pp. 20, figs. 11*).—Supplemented by an article by J. R. Watson and H. E. Bratley, entitled The Chinch Bug on St. Augustine Grass, this paper presents general information on the most important species of lawn grasses, preparation of seed beds and renovation of old lawns, care of the lawns once established, and upon species especially suited for winter lawns.

FORESTRY

The structure and life of forest trees, M. Büsgen, rev. by E. Münch, trans. by T. Thomson (*London: Chapman & Hall, 1929, 3. ed., rev. and enl., Eng. trans., pp. XI+436, pls. 26, figs. 129*).—A comprehensive treatise on the gross and anatomical structure of the tree and upon the physiology of its growth, metabolism, water intake, etc.

Need mineral soil for spruce and balsam seedlings, P. W. Robbins (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 79–81*).—Pointing out that litter, sod, raspberry bushes, and hazel brush create adverse conditions for natural reproduction, especially of spruce and balsam, the author reports that exposure of the mineral soil by plowing irregular furrows after killing weed trees by girdling greatly increased the number of spruce and balsam seedlings and favored their survival.

[Forestry at the Ohio Station] (*Ohio Sta. Bul. 446 (1930), pp. 186–203, figs. 3*).—The usual annual report (E. S. R., 61, p. 442).

Statistical data are presented by B. E. Leete on the number, size, distribution, and cause of forest fires. As reported by E. Secrest, a total of over 3,000,000 trees was distributed in 1929, farmers receiving the larger part. Administrative activities in the management of State forest parks, etc., are discussed by O. A. Alderman, and descriptive notes are presented by Secrest on numerous evergreens which have been tested for ornamental purposes and found worth while.

[Forestry investigations at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 133–135, fig. 1*).—Cooperative studies with the Lake States Forest Experiment Station of the U. S. D. A. Forest Service upon 120 areas of second growth white pine ranging in age from 25 to 125 years showed that at 50 years of age yields ranging from 8,000 to 30,000 bd. ft. per acre may be obtained. At 50 years on fertile soil there may be over 300 trees per acre over 8 in. in diameter, with some as large as 13 in. The economic possibilities of second growth white pine are considered.

Ohio forest fire warden's manual, B. E. Leete (*Ohio Sta. Forestry Pub. 3 (1926), pp. 32, fig. 1*).—General information of use to local fire wardens on the control and prevention of forest fires and carrying out of fire laws is offered.

Ohio forest fire warden's manual, B. E. Leete (*Ohio Sta. Forestry Pub. 5 (1929), pp. 35, fig. 1*).—A revision of the above.

Selective logging in the northern hardwoods of the Lake States, R. Zon and R. D. Garver (*U. S. Dept. Agr., Tech. Bul. 164 (1930), pp. 47, figs. 5*).—In the belief that selective cutting rather than clear cutting should prevail in the northern hardwood areas of the Lake States region, studies were conducted at four points in northern Wisconsin and Upper Michigan upon the costs of logging and milling trees of different sizes and species, upon the quantity, grade, and value of lumber produced from them, and upon the net returns when different proportions of the total stand were removed under selective cutting.

Under the conditions of the study the highest profit per 1,000 bd. ft. occurred with trees 18 in. or more in diameter. The highest profit per acre was secured when no trees below 12 in. in diameter were cut. A change from clear cutting with a 9-in. minimum to a diameter limit cutting did not increase costs until a diameter limit of about 16 in. was attained. The most profitable diameter limit was found to vary according to the distribution of trees by diameter classes, species composition of the stand, price of lumber, and system of management. Under selective logging the annual increment per acre is estimated at from 102 to 240 bd. ft., depending on number, size, and species of trees left at time of cutting, and on the quality of site.

Among advantages of selective logging are (1) the small log problem is solved by leaving such timber uncut, (2) quality of timber is improved, since only the larger trees are cut, (3) valuable species can be encouraged by removing the less desirable, (4) fire hazard is lessened because of smaller amounts of slash and because of more favorable moisture conditions beneath trees as compared with those in the open, and (5) a sustained lumbering industry with its attendant advantages is made possible.

The Christmas tree industry, E. Secrest (*Ohio Sta. Forestry Pub. 6* [*1930*], *pp. 8, figs. 3; also in Ohio Sta. Bimo. Bul. 143* (*1930*), *pp. 53–59*), *figs. 3*).—Concise information is presented on desirable species, methods of seeding, transplanting, and of culture, and upon the general aspects of the industry.

DISEASES OF PLANTS

Indiana plant diseases, 1925, M. W. Gardner (*Ind. Acad. Sci. Proc., 42* (*1926*), *pp. 231–247, figs. 10*).—This is the seventh of the annual series, the previous numbers of which have been noted (E. S. R., 57, p. 343).

"The diseases of outstanding importance this season were apple fire blight and bitter rot, cantaloupe leaf blight, celery late blight, peach brown rot, potato blackleg, tomato Septoria leaf spot and early blight, and watermelon anthracnose. The diseases or parasitic organisms not previously reported for the State, at least in this series, include: Bacterial root rot of alfalfa, surface rot of apple, bacterial spot of buckwheat, geranium mosaic, Sclerotium dry rot of gladiolus, kohlrabi yellows (*Fusarium conglutinans*), Rhizoctonia thread blight of black oak, onion blotch (Macrosporium) and silver spot (Penicillium), radish mosaic and Alternaria spot, and raspberry powdery mildew."

[Plant pathology at the South Mississippi Substation], W. R. Perkins, W. S. Anderson, and W. W. Welborne (*Mississippi Sta. Bul. 274* (*1929*), *pp. 9–14*).—The results of various quantitative and qualitative tests of potash fertilizers as controls for cotton wilt, as indicated in the resulting yields of seed cotton, are presented and show rather inconsistent returns. Of various organic mercury and other disinfectants used in the treatment of cottonseed none was notably beneficial as regards germination, control of wilt, or yields.

Botany and plant pathology [at the Ohio Station] (*Ohio Sta. Bul. 446* (*1930*), *pp. 59–77, figs. 2*).—Comparing several dusts and sprays as controls for apple scab, H. C. Young and C. May found that the sulfur dry lime-sulfur dust checked scab nearly as well as did the spray. Sulfur manganar-aluminum hydrate dust was better than the regular commercial dusting sulfurs but not quite equal to sprays. Determining materials for the control of Brooks spot, Young and L. M. Ames found that Bordeaux mixture effectively controlled the disease, which apparently wintered over on old leaves in much the same manner as does apple scab.

Studies by Young in the control of cherry leaf spot indicated that liquid lime sulfur, 1–40 or 1–50, when properly timed is the most effective control material. In seasons of little infection dusts and dilute sprays sometimes gave control but were not consistently useful. The toxic factor in sulfur was found by Young and Liming to be an oxidation product, pentathionic acid. A sulfur dust containing arsenic was developed which proved safe and effective on apple foliage. Hydrogen sulfide was not found to be toxic.

Studies by P. E. Tilford again indicated that a good grade of hydrated lime is as effective as stone lime in making Bordeaux. High calcium lime gave somewhat better results than did high magnesium lime. Sprays applied to potato foliage at 400 lbs. pressure gave better results than at either 200 or 600 lbs. Fresh mixed copper lime dust was superior to older dust, but no dust was equal to the best spray.

Aster yellows, caused by a virus which is carried from weeds to the aster through the agency of a leafhopper, was quite well controlled by Tilford by surrounding the plants with a 5-ft. fence constructed of 18-mesh screen wire.

Greenhouse carnations were found by Tilford to differ widely in their resistance to rust disease, and a classification of varieties is presented. That dahlia stunt disease may be transmitted through the tubers and also in some undetermined way from diseased to healthy plants was demonstrated by Tilford, who suggests that the causal organism is a virus probably carried by insects. Roguing of diseased plants is advised. Bichloride of mercury was found by Tilford to be highly effective in controlling scab on gladiolus corms. A dust made up of 75 per cent of 300-mesh sulfur, 15 per cent of ground dry lime sulfur, and 10 per cent of arsenate of lead proved successful in controlling black spot on the rose without seriously staining the leaves.

As reported by May, juniper blight caused by the fungus *Phomopsis juniperovora* was not satisfactorily controlled by Bordeaux. A blight, *Thelephora laciniata*, occurring on the foliage of white pine and Norway spruce seedlings was controlled by spraying with Bordeaux or dusting with a 20–80 copper lime dust. Aeration lessened the trouble. Of several disinfectants tested by May as controls for damping-off of pine seedlings, liquid formaldehyde proved best. Applications of aluminum sulfate reduced soil acidity to a distinctly harmful degree and at the best was not beneficial in controlling damping-off.

Studies by R. C. Thomas upon the structure and composition of the fungus hyphae of Sclerotinia are reported upon in some detail, and show marked variation from the results obtained in the preceding year with Fusaria (E. S. R., 61, p. 445). A bacterial canker of tomato known as the Grand Rapids disease was observed by Thomas to be transmitted through the seed and also from plant to plant by humans. It is believed that the organism lives over in the soil, necessitating sterilization before resetting to tomatoes. A new disease was discovered by Thomas on sweetclover, but though transmitted by inoculation it apparently required a very humid environment for development.

Bordeaux mixture was found by J. D. Wilson and H. A. Runnels to be a satisfactory control for ginseng blight, *Alternaria panax*. As a result of testing several kinds of dusts for the control of stinking smut of wheat, J. D. Sayre concludes that formaldehyde dusts are not to be recommended. Iodine gave the best control. However, for the control of oat smut formaldehyde dust proved very satisfactory. Dust treatment of seed corn is deemed of doubtful value in the light of tests in two localities. Comparing dry and liquid formalin for treating onion seed in control of smut, Wilson concludes that in wet years the dry treatment is better, while in dry seasons the reverse is true. Tests by Wilson and Thomas of various materials for control of cucumber disease in the field showed that various treatments reduce bacterial wilt, but none gives complete control and no treatment entirely checked mosaic.

[Plant pathology at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 40–42, 56–58, 102, 103, 104–115, figs. 8*).—Studies by J. Johnson upon virus infections of the potato indicated that all apparently healthy plants of standard varieties carry a virus, which is a mild or attenuated form of a much more serious disease known as rugose mosaic.

Cucumber mosaic was found by I. A. Hoggan to be carried from diseased to healthy tobacco by four species of aphids, but apparently these insects did not transmit tobacco mosaic from diseased to healthy plants. The aphid *Myzus pseudosolani*, also apparently unable to transmit tobacco mosaic, was able to carry this virus from infected tomato plants to tobacco and also to several other solanums. The peach aphid retained cucumber mosaic only a short time, but acquired or transmitted the disease in a very short feeding period. Both the peach and potato aphids can transmit cucumber mosaic to spinach. The symptoms produced in spinach closely resembled ordinary spinach blight and suggested a relationship between the two.

Investigations conducted by B. L. Wade and R. A. Brink upon the inheritance of resistance to pea wilt caused by *Fusarium orthoceras pisi* showed that resistance behaves as a simple dominant character. Crosses between resistant and susceptible plants yielded all resistant forms, which in the next generation segregated. Resistance and susceptibility were clear-cut.

Studies by C. R. Burnham and Brink on the inheritance of wilt resistance in flax indicated that resistance is not transmitted as a simple character but is governed by at least three main genetic factors and probably also by modifying genes. The first generation of crosses between resistant and susceptible plants was all susceptible, while in the third generation a few families showed some resistance.

As determined by J. G. Dickson, the barley scab organism lived over winter on old cornstalks and other plant residues, and it can be largely eradicated by the simple expedient of thorough plowing under of such refuse. Suggestions are given for handling diseased crops.

Control work on apple scab by G. W. Keitt and D. H. Palmiter showed that the preblossom period is very critical in scab control and indicated the necessity of keeping the trees thoroughly sprayed from the delayed dormant stage to the time the blossoms are open. Nine applications of a sulfur-arsenate dust failed to control scab.

Under optimum conditions in the greenhouse for scab infection, J. M. Hamilton and Keitt obtained very good control with lime sulfur 1-40 plus arsenate of lead 1-50 when applied 35 hours after the beginning of an infection period at 59° F. and 100 per cent relative humidity. When the plants were subjected for brief periods to temperatures of from 79 to 83°, the interval after inoculation at which the sprays could be effectively applied was lengthened. Sulfur dusts and wettable sulfur were much less effective than lime sulfur in checking the disease after infection had occurred. Calcium arsenate and lead arsenate when used alone gave little control of scab. However, when combined with lime sulfur or calcium sulfide, lead arsenate increased the effectiveness of the treatments, especially under moist conditions. Neutral soap added to wettable sulfur increased its effectiveness, and the soap alone reduced scab to about one-half that which developed on the controls. An alkaline soap gave even better control.

A study by W. H. Wright, A. A. Henrickson, and A. J. Riker of single-cell isolations of 8 crown gall and 9 hairy root cultures showed diversified growths on laboratory media. The cultures from single-cell isolations were very consistent in their behavior, leading to the suggestion that this method of technic offers invaluable means of studying the variability or constancy of bacteria.

That hairy root is a specific plant disease was determined by Riker, W. M. Banfield, Keitt, Wright, and H. E. Sagen in following the behavior of inoculated plants through two years. The roots stimulated by the hairy root organism were found capable of sustaining the life of apple, Delphinium, and Paris daisy plants after all other roots were removed. Covering the wounded surfaces of piece-root grafts with adhesive tape greatly reduced the percentage of root knots.

S. Ivanoff and Riker, by mixing the crown gall bacteria prior to inoculation with other stainable forms, with India ink, or with dead crown gall bacteria, were able to follow their movement in the tomato tissue. The initial progress of the bacteria appeared dependent largely on physical forces, such as capillarity, negative pressure, diffusion, and convection currents.

Banfield, Riker, and Keitt found that the organism which causes tiny beads or elongated ridges of white granular gall tissues to develop on the fruiting canes of the black raspberry is a distinct bacterium, which upon inoculation of healthy tissues induces the same phenomena.

Work conducted by L. R. Jones and R. S. Riker with China asters resulted in the development of strains possessing high resistance to wilt disease. Aster yellows was controlled by growing plants in a cloth tent, which effectively excluded the leafhopper carrying the virus.

Discovering that resistance to yellows in the cabbage plant is controlled by a simple Mendelian factor, J. C. Walker succeeded in developing fully resistant stocks of All Head Select, Globe, and Marion Market, and also made progress in the breeding of resistant early varieties. Pure lines of resistant cabbage were able to resist infection even when the soil was kept constantly at 77°. The fungus was found by R. Smith to enter susceptible plants almost entirely at the extreme root tips. The fungus rarely enters resistant plants, and if so fails to establish itself in the water vessels. The basis of resistance was apparently chemical rather than anatomical.

S. P. Doolittle of the U. S. Department of Agriculture and H. L. Blood found that the virus organisms causing mosaic and streak of tomatoes may survive in greenhouse soils for from 90 to 100 days, making possible the reduction of the disease by the planting of interim crops of some other species. Steam sterilization of soil was effective in preventing infection from the soil. The organisms were found unable to overwinter out of doors. The nature and symptoms of the disease are discussed.

A chemical compound apparently directly responsible for the resistance of onions to smudge disease and neck rot was isolated by K. P. Link, A. Dickson, H. R. Angell, and Walker. The substance, designated as protocatechuic acid, was most abundant in highly pigmented onion scales. In white onions possessing little resistance the acid was almost absent from near the neck of the bulb.

Fungus diseases of cereals and sunflower during the summer of 1927 at the Saratov Agricultural Experiment Station [trans. title], L. A. Lebedeva (*Zuhr. Gyptn. Agron. I͡ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur-Russlands*), *5* (*1928*), *No. 2, pp. 241–252; Eng. abs., pp. 251, 252*).—Field observations during the summer of 1927 showed that the development of parasitic fungi was checked by drought so that *Puccinia triticina* and *Erysiphe graminis* did but little harm, though an increase of wheat rust (*P. triticina*) developed following a period of rain in July. Incidence percentages were highest on a local variety of Poltavka, Alborubrum 813, Lutescens 252, and Erythroleucon 3414. Durum wheats (Hordeiforme, Melanopus, Beloturka) showed their normal resistance to both *P. triticina* and *E. graminis*.

During an investigation of *P. helianthi* on sunflower plants of 22 varieties no direct connection was observed between the degree of infection of the host by the aecial stage and its spread in the uredostage. Early low varieties of Helianthus appeared more susceptible to rust, late tall varieties more resistant, except that in case of a hybrid, 206×169 F_2 No. 258, greater susceptibility was apparent in a higher infection rate.

Infection of seeds in different years [trans. title], L. C. Doijer (*Dept. Binnenland. Zaken en Landb.* [*Netherlands*], *Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta., No. 30* (*1925*), *pp. 336–349*).—An account is given, covering several years, of the infection of planting seed by different fungi named.

Stinking smut in Siberia, A. Potapov (*Golovni͡a v Sibiri. Irkutsk: Irkutsk. Oblastn. Selsk. Khoz. Opytn. Sta.* [*Irkutsk Agr. Expt. Sta.*], *1927, pp. 90*).—A critical review is presented of the problem of cereal smut (*Tilletia tritici* and *T. levis*) with special reference to Siberia, including the life history of the organisms, the chemistry of the spores and their effects on feeding them to animals, the relations of soil and seed infection, the effects of weather conditions, the relation of host to parasite, the relations of the pathology of the organism to cultural methods, and the smut-resistant varieties of wheat. The author discusses the determination of smut, analysis of seeds for smut, the organism as a saprophyte and the cultural methods used for the study of the organism, quantitative determinations of smut in seeds, methods of determining the number of spores in one infected seed and the weight of a definite number of spores, analyses of the air for the presence of smut, methods of seed treatment and the sterilization of seed, and culture media for the study of the fungi. The account of methods for combating the parasite is principally a review of the preparations used for seed treatment.

A list is given of 32 Russian, 62 English, and 14 German references on the subject.

Corn diseases in Florida, A. H. Eddins (*Florida Sta. Bul. 210 (1930), pp. 35, figs. 25*).—A general discussion of the nature and control of various diseases affecting the corn plant, with information on methods of seed curing, storing, and testing, and of the breeding of disease-resistant strains.

Seed treatment for seed-borne diseases of cotton, H. F. Wallace (*Mississippi Stat. Bul. 271 (1929), pp. 13, 14*).—Tabulated data are presented on the results of a test of several seed disinfectants and show that Corona Merco and iodine with Bentonite were the most effective materials.

Angular leaf spot and fruit rot of cucumbers caused by Bacterium lachrymans E. F. S. & Bry., G. F. Weber (*Florida Sta. Bul. 207 (1929), pp. 32, figs. 16*).—Finding that fruit rot of cucumbers was invariably associated with angular leaf spot, a study was made of the interrelationship of the two, leading to the observation that angular leaf spot and fruit rot are caused by a single organism (*B. lachrymans*). Cross inoculation with leaf and fruit organisms produced indistinguishable lesions.

Observations on 36 varieties of cucumbers showed little or no variation in susceptibility. The fruit rot resulted in 98 per cent of the cases observed from infection which occurred upon the flat or concave surface of the cucumber. The organism penetrated directly to the placenta, spreading rapidly in the spongy tissue lying parallel to the long axis. The disease was found to be transmitted through the seed and to be entirely controlled by immersion of the seed for 10 minutes in a 1–1,000 bichloride of mercury solution. Treatments extending up to 165 minutes caused no noticeable injury to the seed of one variety thus tested.

Cucumber diseases in Florida, G. F. Weber (*Florida Sta. Bul. 208 (1929), pp. 48, figs. 37*).—A revision of an earlier noted bulletin (E. S. R., 54, p. 746) and in a like manner presenting information on the nature and control of various cucumber diseases.

Seed potato disinfectants compared, H. C. Moore and E. J. Wheeler (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 94, 95*).—An average of results obtained at three different localities showed the largest percentage of scab-free and black scurf-free potatoes in the corrosive sublimate treated lot. Hot formaldehyde gave very good results, being slightly superior to corrosive sublimate in scab control.

Nematodes in relation to growth failure of sugar cane in Hawaii, G. H. Cassidy and R. H. Van Zwaluwenburg (*Assoc. Hawaii. Sugar Technol. Rpts., 6 (1927), pp. 10–15, figs. 3*).—The nematodes found most commonly attacking sugarcane roots in Hawaii are, in order of percentages of plants attacked, *Tylenchus similis* (55 per cent), *Heterodera schachtii* (31 per cent), and *H. radicicola* (21 per cent). About 15 per cent of the more than 500 samples showed no nematodes in the roots. The effects on the sugarcane are discussed.

The predacious Mononchus species in the soil supposedly attack with some good effect *T. similis* when it emerges from old broken-down roots in search of fresher supplies. In case of Heterodera, the parasitic fungus Microcera appears to be of value. Heavy application of molasses or of mud press are regarded as remedial rather than as control measures. The nematodes are not killed, but the roots are so stimulated that the injury does not seriously hamper production. However, it is thought that both molasses and mud press provide something more than a mere increase of plant food.

Fallowing may afford relief from *T. similis*, as it does not enter a cyst stage. Heterodera is known to form a cyst highly resistant to adverse conditions, specifically drought. This nematode is claimed to have remained unharmed in this stage for 25 years.

Since nematodes are highly selective as regards hosts, certain species showing even a varietal selection, alternation of cane varieties is suggested. The catch crop method has not yet proved practical in these islands.

Further study of the relation between soil conditions and nematodes in cane roots, G. R. STEWART (*Assoc. Hawaii. Sugar Technol. Rpts., 6 (1927), pp. 16–21, fig. 1*).—The work of the previous year as reported (E. S. R., 58, p. 749), summarizing the results of the first pot experiment, showed heavy root destruction in association with the presence of nematodes, but did not exclude the possible agency of soil fungi or bacteria in the punctured roots. Experimentation in growing cane in sterile soil and then adding nematodes gave no great amount of root breakdown due to nematodes, and further work was regarded as needed in which nematodes should be added to sterile cultures both in the absence and in the presence of pathogenic soil fungi.

Cooperative pot studies by entomologists and chemists upon treatment of infertile soils from central Maui indicate the value of the mud press, molasses, and organic matter in reducing nematode injury to cane roots. The experiment is being extended to small-scale field treatments, the residual effect to be determined in the pot cultures.

Some common tomato diseases and their control, S. H. ESSARY (*Tennessee Sta. Circ. 31 (1930), pp. 4*).—A brief discussion of the nature and methods of control of four diseases, a wilt, two leaf spots, and a mosaic.

Experiments in controlling apple scab with dusts, C. MAY and H. C. YOUNG (*Ohio Sta. Bimo. Bul. 143 (1930), pp. 49–52, fig. 1*).—After 0.64 in. of rain about one-half of the sulfur spray materials remained on apple leaves, as compared with 37 per cent for the most adhesive dust. After a 1.31-in. rain sulfur residues were much more nearly equal. The results of tests of dusts in several localities in 1928 and 1929 are summarized in tabular form and show that the 85–15 sulfur-dry lime-sulfur and the 90–10 sulfur-manganar dusts were the most effective. Recommendations are given.

Black root of strawberry ruins plantations, F. C. and M. C. STRONG (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 75–79, figs. 3*).—A description is given of the symptoms of a disease which is said to cause large losses of plants in newly set strawberry plantations and also to cut down the productive life of established beds. Various soil organisms (*Fusarium* sp., *Coniothyrium* sp., and *Patellina* sp.) were found associated with the disease. Sterilization with formaldehyde or mercury compounds was not effective in control, leaving as practical measures only the selection of strong, vigorous plants with clean white roots, and good management.

A Botrytis disease of Ribes odorata Wendl., J. M. VAN HOOK (*Ind. Acad. Sci. Proc., 42 (1926), pp. 253–255, fig. 1*).—A brief account is given of a clump of bushes of golden currant (clove bush) showing attack by Botrytis, supposedly a strain of *B. cinerea*, during some 8 years. The local situation, symptoms, and progress are described.

Wilt diseases of coconut palms in Trinidad, Part I, H. R. BRITON-JONES (*Trop. Agr. [Trinidad], Sup., May, 1928, pp. 12, figs. 3*).—Descriptions are given of the two forms of wilt diseases of coconut palms in Trinidad, designated, respectively, as bronze leaf wilt and yellow leaf or tapering stem wilt.

Bronze leaf wilt, the main form dealt with in this account, becomes evident only after a short dry period under certain soil conditions, particularly those prevailing under faulty tilth. Typical symptoms of bronze leaf wilt have been reproduced under experimental conditions.

Yellow leaf or tapering stem wilt is a chronic malady, and its etiology has not yet been worked out.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The normal breeding season and gestation period of martens, F. G. ASHBROOK and K. B. HANSON (*U. S. Dept. Agr. Circ. 107 (1930), pp. 7*).—Observations made by the Bureau of Biological Survey and in other countries show that the normal breeding season of the marten (*Martes americana*) occurs during the summer months, usually between the middle of July and the third week in August, and not during the winter months. From the experiments conducted it has been definitely determined that the gestation period ranges from approximately 8.5 to 9 months (259 to 275 days) instead of from 60 to 102 days as has been heretofore generally accepted to be the case.

Entomology (*Ohio Sta. Bul. 446 (1930), pp. 78–93*).—This is a brief summary of information on the work of the year (E. S. R., 61, p. 450), including that with the more important insect enemies, namely: The oriental fruit moth (*Laspeyresia molesta* Busck), by L. A. Stearns and R. B. Neiswander (E. S. R., 62, p. 248); the codling moth, by C. R. Cutright and J. S. Houser; commercial control of the rosy apple aphid, the apple aphid, and the European red mite, all by Cutright; the apple flea weevil, by Houser; the potato flea beetle and the potato scab gnat (*Pnyxia scabiei* Hopk.), both by H. L. Gui; the onion maggot, by Houser and J. P. Sleesman; the garden centipede (*Scutigerella immaculata* Newp.), by G. A. Filinger; the common stalk borer (*Papaipema nitela* Guen.) and the lined stalk borer (*Oligia fractilinea* Grote), both by Neiswander; constant temperature apparatus, by Houser, J. R. Savage, and Filinger; evaporation survey of Ohio, by J. D. Wilson and Savage; and the European corn borer (E. S. R., 61, p. 56), including infestation, by L. L. Huber, Savage, and E. A. Herr, seasonal behavior of the corn borer, by Neiswander, J. B. Polivka, and Herr, the relation of the habitat to corn borer infestation, by Savage, Polivka, and E. G. Kelsheimer, resistance, by Neiswander and Polivka, corn breeding and the corn borer, by Huber, and recommendations by Huber and Neiswander.

[Projects on economic insects at the South Dakota Station] (*South Dakota Sta. Rpt. 1929, pp. 16–19*).—It is pointed out that in South Dakota there are two varieties of the common black field cricket, *Gryllus assimilis assimilis* Fab. and *G. assimilis lineaticeps* Stal.

The plum tree borer (*Synanthedon pictipes* G. & R.) has been found to occur in practically all plum plantings in the eastern part of the State and in many sections of the western part in both tame and wild plum thickets. The work thus far conducted indicates that the borer has but one brood per year at Brookings, with the parent forms or moths emerging during late May, June, and early July. The work of the year again demonstrated the feasibility of the use of paraffin and paradichlorobenzene as an efficient control measure.

[Work with economic insects at the Wisconsin Station] (*Wisconsin Sta. Bul. 410* (*1930*), *pp. 45–54, figs. 5*).—Reference is first made to a survey by C. E. Woodworth of the damage to Wisconsin tobacco by cutworms, the most destructive pest, it frequently being responsible for from 5 to 50 per cent loss of plants of the first setting. Wireworms in some locations caused as much as 20 per cent loss and hornworms 10 per cent in many of the fields. Flea beetles and grasshoppers seldom injured more than 5 per cent of the plants. Slugs of the species *Agriolimax campestris* Binney were the most serious of the noninsect pests attacking tobacco, some growers losing nearly 100 per cent of the plants in their seed beds. An 8 per cent nicotine-Bordeaux dust, originated by J. E. Dudley, consisting of magnesium limestone 35 per cent, monohydrated copper sulfate 20 per cent, hydrated lime 35 per cent, and nicotine sulfate 10 per cent, gave better results than the hydrated lime and was superior to all the insecticides tested against the slugs.

It is pointed out that in the course of storage the delicacy of flavor and color of honey is gradually lost. Work by G. E. Marvin and H. F. Wilson indicates that the optimum temperature for its storage is below 50° F., honey stored for a year at 32° having shown virtually no change in flavor or color. It is considered clearly proved that honey should never be held in warehouses or other storage places where temperatures are allowed to exceed 80°, since the color of honey rapidly darkens at such high temperatures.

In work with the fruit tree leaf roller, which attacks apple orchards, carefully sprayed orchards suffered a loss of 25 per cent while unsprayed trees showed losses of 80 per cent. In control work by A. A. Granovsky the best results were obtained when the infested trees were sprayed early in the season at the time the buds were swelling, but before much green growth of leaves appeared, with a home prepared cold-mixed oil emulsion, using either Diamond Paraffin oil or Junior Red Engine oil at 8 per cent strength. When thoroughly applied this spray is able to kill 95 per cent of the eggs before they have a chance to hatch. Attempts to kill the larvae later in the season by spraying the trees with a poison (lead arsenate at the rate of 3 lbs. to 50 gal. of water) resulted in the destruction of a good many larvae, but did not prevent injury to the apples on the trees, and proved prohibitively expensive.

A survey by Granovsky of the cherry orchards of Door County showed the case bearer *Coleophora pruniella* Clem. to infest no less than 5,000 acres, on 2,000 of which the infestation was so severe as to result in from 25 to 50 per cent reduction in cherry yields. Both cherries and apples were affected, but the economic losses were greatest with cherries, and many infested trees lost their leaves prematurely and went into the winter in a weakened condition. The young larvae of this pest overwinter in a half-grown stage protected by the case, which is tightly attached to the branches of the trees. In the spring as the buds begin to swell they move to the unfolding leaves and cause injury by eating considerable portions of the new growth, feeding mainly on leaves but also attacking the flowers and the fruit of both cherries and apples. With the development of the foliage the larvae move to the lower surface of the leaves and firmly attach their protective cases to the leaves by webbing and gluing. A small hole is eaten through the outer layer of the leaf just large enough to allow the larva to work its way into the inner part of the leaf, where it feeds. The larvae are fully developed about the middle of June, and they attach their protective cases to the upper surface of the leaves and pupate, in which stage about 30 days are passed. The moths emerge about the middle of July and have been observed to lay tiny eggs promiscuously on the lower side of leaves within a few hours. Young larvae hatch out in about 10 days, tunnel into the inner portion of the leaves, and later come to the surface of the leaf and make their protective cases. These cases and their habit of feeding on the inner portions of the leaves and leaving untouched the leaf surfaces which might be heavily coated with a poison spray render control difficult.

The work of C. L. Fluke has shown that unpastured woodlots are of value in lessening insect damage to crops since they act as reservoirs for predacious and parasitic insects in the early spring.

A study by Fluke of the pea aphids and their natural enemies, a bulletin on which has been noted (E. S. R., 62, p. 56), led to the introduction of the syrphid predator *Scaeva pyrastri* from California.

Report of the chief of the division of entomology [trans. title], G. N. WOLCOTT (*Mem. Estac. Expt. Agr. Soc. Nac. Agr., Lima, No. 1 (1929), pp. 31–62, figs. 12*).—This is a report on the more important insect enemies of sugarcane, cotton, and citrus during the year in Peru, their natural enemies, and means of control.

[Reports on the cotton insects from experiment stations in the British Empire, 1927–28], W. G. WELLS, F. S. PARSONS, J. E. PEAT, H. C. DUCKER, J. V. LOCHRIE, and R. R. ANSON (*Empire Cotton Growing Corp., Expt. Sta. Rpts. 1927–28, pp. 25–28, 73–85, figs. 2; pp. 116–124, pl. 1, fig. 1; pp. 223–225, 243–248, fig. 1; pp. 250–255, 275, 276*).—These contributions include discussions of insect problems in Queensland (pp. 25–28); insect pests at Candover, South Africa (pp. 73–85); insect attacks at Gatooma, Southern Rhodesia (pp. 116–125); insect pests at Makwapala, Nyasaland (pp. 223–225) and at Port Herald, Nyasaland (pp. 243–248); and insect pests in Fiji (pp. 275, 276). A Report on Entomological Work on Cotton, Season 1927–1928 [Nyasaland], by C. B. R. King (pp. 250–255) is included.

Boll weevil and plant lice poisoning work, H. F. WALLACE (*Mississippi Sta. Bul. 271 (1929), pp. 14, 15, 37, 38*).—Work aimed at determining the advisability of poisoning the boll weevil late in the season is briefly considered. It is pointed out that although the year's results are not conclusive in the tests made there was a net profit of about $16 per acre when the two poisoned plats were combined and figured against the check. Nicotine sulfate used either at the rate of 1 part to 8 parts of calcium arsenate or 1 part of tobacco dust to 2 parts of calcium arsenate, 14 lbs. per acre at each application, controlled the plant lice.

A brief reference is made to hibernation work with the boll weevil.

Caterpillar pests of the tea plant and of green manure plants and shade trees in use on tea estates, E. A. ANDREWS (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1929, No. 3, pp. 134–145*).—This is a practical account on caterpillars in general.

Two iris insects, D. T. RIES (*Amer. Iris Soc. Bul. 32 (1929), pp. 27–46, figs. 15*).—The first part of this contribution (pp. 27–38) deals with observations of the iris borer and the second part (pp. 39–46) with the verbena bud moth (*Olethreutes hebesana* Walk.), which feeds on the iris seed pods. The account is based upon observations made in New York and Pennsylvania from 1924 to 1928, but in large part at Ithaca, N. Y., in 1927–28. The data presented on the iris borer supplement the observations of McDaniel in Michigan (E. S. R., 59, p. 456), Diets in Indiana (E. S. R., 59, p. 557), Shull in the District of Columbia (E. S. R., 59, p. 558), and Cory in Maryland (E. S. R., 60, p. 842).

The verbena bud moth, a tortricid known to occur from Massachusetts to Florida, westward to several Central States, and also recorded from Texas, California, British Columbia, Alberta, Manitoba, and Ontario, is a general feeder on members of no less than 13 genera of plants. Entering the seed pod a few days after hatching out, the larvae feed ravenously on the seeds and tissues within, sometimes as many as 5 or 6 larvae being found in a single pod. In from 20 to 23 days the larvae pupate within the pod. The life cycle is completed in New York State in from 43 to 47 days in summer, there being at least four generations each year. Spraying with lead arsenate 1 lb., casein 1 lb., and water 25 gal. soon after the pods had developed and again 8 or 10 days later gave satisfactory results. Dusting the pods 3 or 4 times during the season with sulfur proved effective, and dusting with sodium fluosilicate gave promising results. Cleaning up of the old growth and débris around the beds either late in the fall or very early in the spring does much to control the pest.

The warble flies, L. STEVENSON (*Ontario Dept. Agr. Bul. 350 (1930), pp. 11, figs. 7*).—This is a practical account of *Hypoderma bovis* and *H. lineatum*, with means for their control.

Parasitism of the Mediterranean fruit fly in Hawaii, 1922–1924, H. F. WILLARD and T. L. BISSELL (*U. S. Dept. Agr. Circ. 109 (1930), pp. 12*).—Observations of the parasitism of the Mediterranean fruit fly in Hawaii during the years 1922 to 1924, inclusive, by the three braconids *Opius humilis* Silv., *Diachasma tryoni* Cam., and *D. fullawayi* Silv. and by the chalcid *Tetrastichus giffardianus* Silv., introduced into the island in 1913 and 1914, are reported upon, much of the data being presented in tabular form.

This work, which is a continuation of similar records made since 1914 (E. S. R., 55, p. 558), shows the infestation of fruits to have been considerably less in the majority of hosts than the average infestation per fruit over the nine-year period 1916–1924. "Parasitism by *O. humilis* reached its minimum, 4.1 per cent, in 1923, owing probably to the effect upon it of the two species of Diachasma. In 1924 the parasitism (14.5 per cent) by this species was greater than for any year since 1916. Owing to the hibernation habits of *D. tryoni* during the cooler months of the year, the effectiveness of this parasite decreases during those months and this is accompanied by a corresponding increase in effectiveness by *O. humilis*. The work of these four parasites during the three years under consideration has not varied to any great extent from that of the previous six years. They continued to parasitise nearly 50 per cent of the larvae about Honolulu, causing a corresponding decrease in infestation of the commercial hosts."

The Mediterranean fruit fly situation, H. H. HUME (*Citrus Indus., 10 (1929), No. 9, pp. 5–7, 27, 30, 34*).—This is a discussion of the Mediterranean fruit fly situation in Florida.

Observations on excessive abundance of the midge Chironomus plumosus at Lake Pepin, M. S. JOHNSON and F. MUNGER (*Ecology, 11 (1930), No. 1, pp. 110–126, figs. 2*).—This contribution from the Minnesota Experiment Station reports upon studies made along the shores of Lake Pepin, Wis., where this midge has appeared within the last 10 or 12 years, largely replacing May flies which were formerly abundant. The account includes a list of 23 references to the literature.

Life-history of beet leafhopper, Eutettix tenellus (Baker) in California, H. H. P. SEVERIN (*Calif. Univ. Pubs. Ent., 5 (1930), No. 4, pp. 37–88, pls. 4, figs. 16*).—This is an extended account of the life history and habits of the beet leafhopper.

Tree hoppers and their control in the orchards of the Pacific Northwest, M. A. YOTHERS (*U. S. Dept. Agr. Circ. 106 (1930), pp. 15, figs. 9*).—Field observations and experiments made for the most part at Yakima, Wash., at various times and incidental to other work during the years from 1923 to 1926, inclusive, are reported upon. The tree hoppers noted include *Ceresa albidosparsa*

Stål., *C. basalis* Walk., *C. borealis* Fairm., the buffalo tree hopper, *C. femorata* Fairm., *C. taurina* Fitch, *Stictocephala gillettei* Godg., *S. inermis* Fab., *S. pacifica* Van D., *S. wickhami* Van D., *Campylenchia latipes* Say, *Flossonotus univittatus* Harr., *Heliria rubidella* Ball, *Publilia modesta* Uhler, and *Telamona barbata* Van D. Of these only the buffalo tree hopper, *S. inermis*, and *C. basalis* are recognized as common enough to be of economic importance in that area, although *H. rubidella* has been found in considerable numbers on apple trees in the Wenatchee district and rarely in the Yakima Valley, Wash., and in southern Idaho. *S. gillettei*, which has no common name, is an important species in Utah, but is unknown in the Yakima Valley.

The account deals with the distribution, nature of injury, food and oviposition plants, general description of tree hoppers, life history, natural enemies, and preventive and control measures. Two species of parasites have been reared from the eggs of *S. inermis*, namely, *Philodromus minuta* Bks. and *Dendryphantes militaris* Hentz. A number of predacious enemies have been noted, and certain mites are known to destroy the eggs of *S. inermis* and *C. basalis*.

Megymenum brevicorne F. Pentatomidae (Hemiptera-Heteroptera), a minor pest of Cucurbitaceae and Passifloraceae, N. C. E. Miller (*Malayan Agr. Jour., 17 (1929), No. 12, pp. 421–436, figs. 7*).—This is a contribution on the anatomy, life history, and habits of a pentatomid which occurs not only in Malaya but also in India and has been reported from China.

The bluegrass webworm, G. G. Ainslie (*U. S. Dept. Agr., Tech. Bul. 173 (1930), pp. 26, figs. 4*).—This is the sixth of a series of contributions to a knowledge of the Crambinae of North America (E. S. R., 58, p. 455). It reports upon observations of *Crambus teterrellus* Zinck., a species widely distributed throughout the eastern and southeastern parts of the United States, being more continuously abundant over the bluegrass regions of Kentucky and Tennessee than any other part of its range. In ordinary seasons it is a cause of serious depletion of pastures, and in dry years may be the real cause for the complete killing out of sod in pastures and lawns.

Under ordinary conditions, there are three broods each year, but they vary so greatly in their rate of growth that progeny of a single moth may cover one, two, or three generations in the same season. The eggs are dropped promiscuously, from 200 to 250 being the average number produced, although as many as 564 eggs have been deposited by a single individual. The larvae construct flimsy tubes of silk and earth particles, from which they emerge at night to feed. The normal number of instars for this species seems to be 8, although there is great variation. As many as 20 instars have been observed in the case of some specimens, but in such cases there was no increase in size after the eighth instar. The pupae are formed in loosely made pupal cases constructed separately from, but near, the feeding burrow. The moths become active about dusk, and are attracted to lights in large numbers. They do not feed, except possibly on water.

A single parasite, *Cymodusa mississippiensis* Ashm., was reared during the course of the work, and several predators were observed attacking both larvae and adults. The use of ordinary poisoned bran bait gave no apparent results in the control of the larva, but by combining it with some attractive substance it is thought possible that an effective bait may yet be devised.

A list of 21 references to the literature is given.

The bionomics of the tortricid moth, Eulia mariana (Fern.), F. C. Gilliatt (*Roy. Soc. Canada, Proc. and Trans., 3. ser. 23 (1929), Sect. V, pp. 69–84, pls. 4*).—This is a report of studies of a lepidopteran, first observed for several years previous to 1925 to attack the fruit of apple in orchard experimental plats near Berwick, N. S., which was reared and identified in 1926 as *E. mariana*. The common name gray-banded leaf roller was proposed for it. It has since been observed in other localities in Nova Scotia and definitely reported from Maine, Massachusetts, Pennsylvania, and New York. In Nova Scotia it has been found on fruit trees, deciduous forest trees, bush fruits, and a variety of weeds. During the past three years it has demonstrated its capacity for causing serious injury to the apple, fruit in some infested orchards having been damaged to the extent of 25 to 30 per cent although the orchards received from 5 to 7 applications of insecticides.

The pest has been recorded by Frost (E. S. R., 48, p. 54) as feeding upon both the foliage and fruit of the apple in Pennsylvania, but there it is of minor importance.

Preliminary observations on a weevil, Brachyrhinus cribricollis (Gyll.), with comparisons to related forms found in California, S. LOCKWOOD and H. H. KEIFER (*Calif. Dept. Agr. Mo. Bul., 19 (1930), No. 1, pp. 16–39, figs. 26*).—A European weevil, *B. cribricollis*, new on the North American Continent, has become established in southern California. The pest is said to be closely related to the strawberry root weevil (*B. ovatus* (Linn.)) and the black vine weevil (*B. sulcatus* (Fab.)), its larvae feeding in the same manner. It has already shown a preference for certain host plants, which include privet and other ornamentals rather than deciduous fruit trees, citrus, and olives as reported in other regions. The adult is readily controlled with dried fruit pulp and an arsenical, as well as spraying with basic arsenate of lead in the amount of 5 lbs. to 100 gal. of water. Other species of the genus and of two related genera are briefly noted.

A list of 20 references to the literature is included.

Damage to conifer seedlings by larvae of the clay weevil, Otiorhynchus singularis L. (syn. O. picipes F.; O. squamiger Steph.), E. V. LAING (*Scot. Forestry Jour., 43 (1929), pt. 2, pp. 159, 160*).—The author here records a case of extensive damage to Scots pine seedlings by the grub of this weevil. He calls the attention of foresters and nurserymen to an insect which can be a serious pest in the nursery and which because of the similarity of damage can be confused with chafer beetles.

The strawberry root-weevil as a pest in conifer nurseries, E. I. MCDANIEL (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 102–105, figs. 3*).—The strawberry root weevil or crown girdler (*Brachyrhinus* (*Otiorhynchus*) *ovatus*) appeared during the spring of 1929 as a major enemy of young evergreens in one of Michigan's largest conifer nurseries. Its attack on seedlings and young trees in the nursery that year appears to have been the first appearance in sufficient numbers in the State to be of any very great economic importance. The larvae live under ground and develop in old established grass sod, strawberry beds often being infested, especially those that have been planted for three or four years.

A careful examination of spruce seedlings from three-year-old seed beds being removed for transplanting and shipping were found to have the bark for an inch or two below the soil level stripped from the main roots in large patches so that the roots in some cases were completely girdled. At least two-thirds of the three-year-old Norway spruces in the nursery were injured to such an extent that they were worthless, and practically all the seedlings showed some injury. The lavae were also found producing their characteristic injury in all other conifer seed beds in the nursery, including western yellow pine, white pine, jack pine, red pine, white spruce, Japanese larch, American larch, and arbor vitae. Damage occurred to a less extent in the two-year-old beds. On April 8 larvae were found at all depths from 1 to 20 in., but by the middle of May they had migrated to considerably nearer the surface and begun to form the cells in which they pupated.

The first adults were captured as they were emerging from the ground on June 3. Observations throughout the season revealed that there is but one generation, though the adults live for a year or more. Some individuals, however, lay eggs both in the fall and in the spring, the winter being passed in both the larval and adult stages.

An extensive series of experiments with soil insecticides is now under way, no very satisfactory method of control having as yet been discovered.

The white pine weevil in New Hampshire, C. C. Plummer and A. E. Pillsbury (*New Hampshire Sta. Bul. 247 (1929), pp. 31, figs. 5*).—In the work with the white pine weevil, here reported, particular attention was given to its life history and bionomics in a State where large areas of white pine are grown and at least 70 per cent are attacked at some time or at various times in its growth. Many of the details of the work, which has been in progress since the fall of 1925, are presented in tabular form, and a chart is given summarizing its life history findings for the years 1926, 1927, and 1928.

Its most important injury, readily observed, is confined to the terminal shoot or leader of the white pine, usually extending only as far as the first whorl of lateral branches. After the terminal shoot or leader has been killed by the feeding of the larvae, the lateral branches next below tend to grow more upright the following year. The host tree may be injured repeatedly from the time it is about 5 years old until its reaches maturity, the most extensive injury taking place when the trees are from 8 to 18 years of age or from 5 to 15 ft. high. While other species of conifers may also be attacked, Norway spruce being probably the next most susceptible host, such infestation is not economically important.

The weevil appears the latter part of April or the first of May and begins ovipositing, from 25 to 201 eggs, with an average of 129, being deposited by the middle of July. Some of the weevils do not die the first year but hibernate and appear a second season. The incubation period of the egg varies from 5 to 20 days, with an average of 9.3 days, in the insectary cage. The larvae may be found from the last of May to the middle of September, from 26 to 41 days, with an average of 36.1 days having been passed in the outdoor cage. The pupal period extends from the middle of July to the last of September, from 9 to 20 days, with an average of 13.9 days, in the outdoor cage. Newly emerged adults remain in the leader for several weeks and feed in the region of new growth before hibernating in the duff.

Brief notes on the northern pine weevil (*Pissodes approximatus* Hopk.) found attacking the trunk and roots of white pine are included. The eggs of *P. approximatus* are laid in the trunk about a foot from the ground. The larvae upon hatching work under the bark of the trunk and larger roots, usually killing the tree. Its life history appears to be similar to that of the white pine weevil.

As a direct means of control it was found that lime-sulfur 1 to 8 may be of value. Silvicultural control may be brought about by planting white pine in mixed or other species of conifers or hardwoods, or by planting white pine densely, namely, at the rate of 1,800 trees per acre. Reference is made to a number of insect enemies, of which the dipterous predator *Lonchaea corticis* Taylor is the most important natural control factor in New Hampshire.

The biology of the bean leaf-beetle, D. Isely (*Arkansas Sta. Bul. 248 (1930), pp. 20, figs. 10*).—The author reports upon studies made of the life history and habits of the bean leaf beetle, the most destructive insect attacking the vegetative parts of beans, cowpeas, and soybeans in Arkansas. The roots and nodules are also attacked by the larvae, although this injury is seldom recognized because of its insidious character.

"The total minimum time required to pass the successive stages from the egg to the sexually mature adult is 26 days. Temperature is the factor of most importance affecting the rate of development. The time required for passing through the immature stages is reduced nearly one-half as the temperature increases from 21 to 30° C. (69.8 to 86° F.). At the lower of these temperatures, 21°, the average duration of the immature stages is as follows: Egg, 13.6 days; larva, 16.6 days; prepupa, 7.33 days; pupa, 10 days. At the higher of these temperatures, 30°, the average duration of these stages is: Egg, 7 days; larva, 8.8 days; prepupa, 3.96 days; pupa, 5 days. The preoviposition period of nonhibernating beetles varies from 5 to 22 days, with an average of less than 9 days. The average number of eggs secured from each female was 257.7, and the maximum 904. Eggs were deposited only by beetles which had fed upon host plants in the seedling stage during the first few days of their adult life. It is possible that the number of generations occurring during a season is dependent upon the availability of seedling hosts at the time of emergence of adults from the soil." The winter is passed in the adult stage. Beetles of three generations were reared at the station, and three generations have been reported by others as occurring in the South.

A brief summary of recommendations for control is included.

ANIMAL PRODUCTION

[Experiments in animal nutrition at the Ohio Station] (*Ohio Sta. Bul. 446 (1930), pp. 149, 150*).The results of three studies are noted.

Influence of fertilizers on the vitamin B content of wheat, C. H. Hunt and W. Hosack.—Continuing this study (E. S. R., 59, p. 258), it was found that the wheat kernel is richer in vitamin B than in vitamin G, but no evidence was found as to the effect of fertilizers on the vitamin B content. The vitamin B content of wheat is considered to be 10, when yeast is used as a standard and its vitamin B content represents 100. The vitamin B content of corn and oats is about the same as that of wheat.

Influence of fertilizers on nutritive value of hays, C. H. Hunt, D. S. Bell, and L. E. Thatcher.—Hay from the Fry farm that had been differently fertilized and also from 5-year rotation plats was fed to lots of 8 lambs each to determine the effect of fertilizer treatment on rate and economy of gains. The fertilizer treatments were (1) superphosphate, unlimed, (2) limed, (3) complete fertilizer, (4) 5-year rotation, limed and unlimed, (5) 5-year rotation, complete fertilizer, limed, and (6) control lot. It required 951. 982, 929, 1,235, 1,111, and 1,009 lbs. of hay from the respective plats to produce 100 lbs. of gain.

Cottonseed meal studies, C. H. Hunt and W. Hosack.—With rats, cottonseed meal was not toxic enough to delay growth, and when properly supplemented with animal proteins and minerals it produced good growth. There were indications that reproduction was affected and the number of young per litter reduced due to cottonseed meal feeding. Cottonseed meals varied in their effect on the reproductive activities of rats.

Commercial feeding stuffs, September 1, 1928, to August 31, 1929, F. D. Fuller (*Texas Sta. Bul. 404 (1929), pp. 173*).—This is the twenty-fourth report of the chemical analyses and microscopical examination of 2,275 feeding stuff samples collected for official inspection during the year ended August 31, 1929 (E. S. R., 61, p. 158).

[Beef cattle experiments at the Ohio Station] (*Ohio Sta. Bul. 446 (1930), pp. 130–132*).—The results of several studies by P. Gerlaugh are noted.

Proteins for yearling steers.—Yearling steers, averaging 730 lbs. per head, made more rapid and economical gains when fed 2 lbs. of linseed meal daily than similar steers fed 2 lbs. of cottonseed meal daily during a 140-day test. There was practically no difference in the steers when 1 lb. of the protein supplement was fed. It was more economical to feed 2 lbs. of linseed meal to yearling steers than to heifer calves. Steers fed 1 lb. of cottonseed meal and an additional pound of shelled corn gained as rapidly and more economically than those fed 2 lbs. of cottonseed meal. These results were not duplicated with linseed meal.

Shelled corn v. ground shelled corn for calves.—More shelled corn was consumed and larger gains made by 6 250-lb. calves than by a similar lot of calves fed ground shelled corn. The gains from initial weight to 750 lbs. cost $8.55 per hundredweight for those fed shelled corn, and $8.90 for those fed ground shelled corn. No whole kernels of corn passed through the digestive tract until the calves weighed more than 500 lbs.

Fattening steers in barn v. open shed.—In 1928 steers fattened on bluegrass pasture made more economical gains than steers fattened in a closed shed. However, in 1929 steers fed in a barn made larger gains than steers fed in an open lot with a shed for shelter. The barn-fed steers had sleeker coats of hair than those fed in the open.

[Experiments with beef cattle at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 75–79, fig. 1*).—The results of two experiments are noted.

Saving labor for the steer feeder.—In a study by J. G. Fuller, G. Bohstedt, and B. H. Roche, 3 lots of 10 yearling steers each were fed the same ration. Lot 1 received half of their ration at 7 a. m. and the other half at 4 p. m., lot 2 was fed once daily at 8 a. m., and lot 3 received their corn in a self-feeder and the rest of the ration at 8 a. m. During the feeding period of 168 days the average gain per animal was 422, 430, and 429 lbs. per head, respectively. The feed consumption was practically the same in all lots, except that lot 3 ate 0.4 lb. more of corn per head daily.

Baby beef from crossbred Angus-Holstein calves.—Continuing this study (E. S. R., 61, p. 161), Fuller and Roche fed 3 lots of 7 calves each for 252 days on the same ration. Crossbred Angus-Holstein calves were used in lot 1, purebred Holsteins in lot 2, and purebred Angus in lot 3. The average initial weight was 478.5, 269.1, and 444.1 lbs. per head, and the average daily gains were 1.95, 2.23, and 1.98 lbs. per head in the respective lots. Lot 2 made the most economical gains, and lot 1 the most expensive, while lot 3 made the greatest return per head over feed cost and lot 1 the least.

In the slaughter tests, lot 1 dressed 62.5, lot 2 59.5, and lot 3 63.2 per cent. There was little difference in the carcasses of lots 1 and 3, but those of lot 2 were angular and rangy. No criticisms were made of the color of fat or lean of any of the carcasses.

The authors outline a plan for crossbreeding for baby beef production.

Variation in weight of cattle due to "fill," P. Gerlaugh (*Ohio Sta. Bimo. Bul. 143 (1930), pp. 37, 38*).—In this study 4 lots of cattle were weighed on three successive days to close an experiment. Lots 1 and 2 were not fed the evening of the third day, while lots 3 and 4 were given their usual evening feed. Water was removed from all lots at 6 p. m. on the third day of weighing. The full weight for the following day was estimated by adding twice the average daily gain to the weight on the second day, and the cattle were actually weighed the fourth day, beginning at 6.30 a. m. The variations between actual empty and estimated full weights were —2.35 and —2.1 per cent in lots 1 and 2, and +0.41 and —0.61 per cent in lots 3 and 4, respectively.

[Experiments with sheep at the Ohio Station] (*Ohio Sta. Bul. 446 (1930), pp. 136–138*).—The results of two experiments are noted.

Breeding Merino ewes as yearlings v. two-year-olds, D. S. Bell.—Delaine Merino yearling ewes that weighed 80 lbs. at breeding time averaged 3 lbs. lighter in weight at 30 months of age after having raised a lamb than their unbred half sisters. Ewes weighing from 70 to 80 lbs. at breeding time averaged 5 lbs. less at 30 months, while ewes weighing less than 70 lbs. averaged 15.5 lbs. less at 30 months of age than unbred ewes. At the second shearing unbred ewes averaged 1 lb. more of grease wool per head than bred ewes, but the latter had an average of 57.5 lbs. of lamb to their credit and had used an additional 49 lbs. of extra grain.

Timothy hay for wintering breeding ewes, D. S. Bell, L. E. Thatcher, and C. H. Hunt.—Ewes fed timothy hay cut when not more than one-third of the heads were in bloom gained 28 per cent more in body weight during the last 67 days of pregnancy than similar ewes fed late-cut timothy. The ewes fed early-cut hay produced strong lambs, while the ewes in the other lot were in poor physical condition and did not raise vigorous lambs. Ewes fed alfalfa hay maintained a slight advantage over the ewes fed early-cut timothy.

Use of Karakul ram on breeds and grades of sheep (*South Dakota Sta. Rpt. 1929, p. 10*).—During a 60-day feeding period, 67 Karakul lambs made an average daily gain of 0.56 lb. per head on a ration consisting of 100 lbs. each of oats and shelled corn and 25 lbs. of linseed meal with alfalfa hay and their mother's milk.

Rutabagas vs. corn silage for breeding ewes (*Wisconsin Sta. Bul. 410 (1930), pp. 80, 81*).—Over a period of 4 years, a total of 80 ewes were fed for experimental periods of 81 days each by B. H. Roche, F. B. Morrison, G. Bohstedt, and F. Kleinheinz (E. S. R., 59, p. 67). Ewes fed roots consumed an average of 2.7 lbs. of rutabagas and 3.5 lbs. of alfalfa hay per head daily as compared with 2.2 lbs. of corn silage and 3.4 lbs. of alfalfa hay in the silage lot. The average daily gains were 0.32 and 0.34 lb. per head in the respective lots. Of a total of 59 lambs born of 40 ewes in the silage group, 57 were strong at birth and 1 was born dead, while only 44 of the 58 lambs in the rutabaga group were strong at birth and 7 were born dead. There was practically no difference in the amount of wool shorn from the 2 groups of ewes. On the basis of feed consumed, the roots were worth two-thirds as much as the corn silage.

Minerals in the winter ration for pregnant and nursing ewes, D. S. Bell (*Ohio Sta. Bimo. Bul. 143 (1930), pp. 38–40*).—Continuing the study of minerals (E. S. R., 59, p. 260), 3 lots of 60 C-type Merino ewes each were fed for 3 successive winters on the same basal ration consisting of grain mixture, alfalfa hay, corn silage, and salt. The respective tests were of 140, 133, and 126 days' duration. Lot 1 received the basal ration only, lot 2 the basal ration plus ⅓ oz. per head daily of a mineral mixture composed of ground limestone, special steamed bone meal, and salt 2 : 2 : 1, to which was added 1 oz. of potassium iodide per 100 lbs. of mixture, and lot 3 the basal ration and access to a mineral mixture in a box.

The average numbers of ewes lambing in the respective lots were 55, 56, and 59. These ewes produced 64, 67, and 67 lambs and raised 60, 62, and 62 lambs. The average birth weights of the lambs were 7.99, 8.36, and 8.18 lbs. per head, and the average weights of lambs at the close of the experiment, when they were approximately 63 days old, were 23.41, 23.62, and 23.8 lbs. per head, respectively. The addition of minerals in lot 2 had no apparent effect on the vigor, health, or condition of the ewes, and while the lambs averaged 0.37 lb. heavier at birth the increased weight increased the difficult lambing from 14 to 39 per cent. The minerals had no apparent effect on the vigor or condition of the lambs at birth or on the gains at subsequent ages. The ewes in lot 3 ate very little of the mineral mixture.

The potassium iodide in the mixture was sufficient to prevent goiter in lambs at birth, none of the lambs in lot 2 showing any such symptoms. One lamb in lot 1 and 3 in lot 3 showed slightly enlarged thyroids at birth, all of which disappeared without treatment. These results indicate that a ration containing a liberal allowance of legume hay has sufficient minerals for pregnant and nursing ewes unless goiter is prevalent in the section.

Fattening rations for western lambs tested, G. A. Brown and G. A. Branaman (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 82–84*).—Continuing the study of fattening rations for western lambs (E. S. R., 61, p. 458), 7 lots of 15 lambs each, averaging approximately 62 lbs. per head, were fed for 90 days. All lots received alfalfa hay, and all but lot 1 received silage. In addition the following feeds were given: Lots 1 and 2, shelled corn; lot 3, shelled corn and linseed meal, 7 : 1; lot 4, oats and linseed meal, 7 : 1; lot 5, oats and linseed meal, 14 : 1; lot 6, barley; and lot 7, oats.

The average daily gains in the respective lots were 0.375, 0.376, 0.388, 0.35, 0.34, 0.331, and 0.311 lb. per head. The cost of feed per 100 lbs. of gain was lowest in lot 1, progressively increasing to lot 7. Adding corn silage to the shelled corn and alfalfa hay ration had no appreciable effect upon rate or economy of gain. The addition of linseed meal to the corn, alfalfa, and silage ration increased the rate of gain slightly, but not enough to pay for the added cost of the meal. The lambs fed corn, alfalfa, and silage gained more rapidly and economically than, and gave a return above feed cost nearly double that returned by lambs fed barley, and a return three times as great as lambs fed oats. Adding linseed meal to a ration of oats, alfalfa, and silage increased the rate of gain and the return per lamb over feed costs. The addition of one-fifteenth part by weight of linseed meal to the oats, hay, and silage ration was practically as efficient as the addition of one-eighth part.

Corn and hog millet for fattening lambs, G. E. Morton, E. J. Maynard, and J. F. Brandon (*Colorado Sta. Press Bul. 71 (1929), pp. 6, fig. 1*).—Continuing the lamb feeding studies (E. S. R., 61, p. 760), 4 lots of 10 lambs each, averaging 53.5 lbs. per head, and 2 lots of 10 ewe lambs each, averaging 67.8 lbs., were fed for 120 days. The first group of lambs were used in a fattening study and the second group in a winter growing-out experiment. All the lots were fed cottonseed meal, and lots 1 to 4, inclusive, received cane hay. In addition the following feeds were given: Lot 1, shelled corn; lot 2, shelled corn and alfalfa meal; lot 3, ground hog millet and alfalfa meal; lot 4, ground corn and ground hog millet, equal parts, and alfalfa meal; lot 5, millet hay; and lot 6, alfalfa meal and millet hay. The average daily gains were 0.34, 0.34, 0.32, 0.33, 0.24, and 0.24 lb. per head in the respective lots.

On the basis of feed required per unit of gain, hog millet had 83.93 per cent the feeding value of shelled corn. While the mixture of corn and millet was more efficient than millet alone, it was not as efficient as corn alone. On the basis of the existing prices, the millet-alone lot produced the cheapest gains. The mixture of cottonseed meal and alfalfa meal as a protein supplement was as efficient and more economical than cottonseed meal alone. The protein mixture caused an increased consumption of carbonaceous hay and made slightly larger gains.

[Experiments with swine at the Ohio Station] (*Ohio Sta. Bul. 446 (1930), pp. 138–141, 148, 149*).—The results of several experiments, five of which are by W. L. Robison, are noted.

Fish meal and trio mixture as supplements for pigs.—Pigs on a ration of corn and fish meal in dry lot gained at the rate of 1.11 lbs. per head daily as compared with a gain of 1.08 lbs. for pigs receiving corn and a mixture of tankage, linseed meal, ground alfalfa, and minerals. The first lot required 411 lbs. of feed and the second lot 436 lbs. per 100 lbs. of gain.

Grinding oats for pigs.—When fed as the only grain to 110-lb. pigs, ground oats produced 20.9 per cent faster gains and saved enough feed per unit of gain to make them worth 10 cts. more per bushel than whole oats. When fed with corn, grinding oats increased their value over whole oats to 26.6 cts. per bushel. For pigs weighing 54 lbs. there was little difference in either rate or economy of gains from whole and ground oats, and rather poor results were obtained when the pigs were fed corn and ground oats.

Full and limited feeding of pigs on pasture.—Pigs averaging 60 lbs. initial weight were fed on clover pasture from June 22 until they reached an average final weight of 200 lbs. Lot 1 was full fed and lot 2 limited fed throughout the experiment, while lot 3 was limited fed to 125 lbs. body weight and then full fed. The respective lots reached the final weight on October 12, December 6, and October 20, respectively. The returns per pig above cost of feed and pasture were $3.02, $2.41, and $3.63, respectively.

Dry rendered tankage.—Dry rendered tankage, which contains 69.3 per cent of protein, was fed with corn and minerals, and with corn, linseed meal, ground alfalfa, and minerals, and compared with ordinary steam rendered tankage containing 60 per cent of protein. The two types of tankage were fed on an equivalent protein basis. The pigs receiving dry rendered tankage required 3 and 3.2 per cent less feed per unit of gain in the respective groups than the lots receiving ordinary tankage. On this basis the protein of the dry rendered tankage was worth from 6 to 9 per cent more per pound than the protein of ordinary tankage.

Preparation of soybeans for pigs.—Whole and ground Manchu soybeans fed free choice with corn and minerals were not palatable to 120-lb. pigs, and composed only 5.3 and 6.2 per cent, respectively, of the rations. The whole beans produced faster and more economical gains than the ground beans. Cooked soybeans fed to pigs on rape pasture produced 14 per cent more rapid gains on 12.5 per cent less feed per unit of gain than ground soybeans, and also produced 3.4 per cent more rapid gains at a saving of 3.3 per cent of feed when compared with tankage.

Effect of sodium fluoride and rock phosphate on bone development in swine.—In a study by R. M. Bethke, C. H. Kick, B. H. Edgington, and O. H. M. Wilder, a basal ration of yellow corn, wheat middlings, linseed meal, salt, and cod-liver oil was fed to groups containing 8 weanling pigs each for 20 weeks. When 2 lbs. of rock phosphate, or more than 30 gm. of sodium fluoride per 100 lbs. of feed, was added to this ration, the rate and economy of gains were decreased as compared with lots receiving 2 parts of limestone or 2 parts of steamed bone meal. The breaking strength of the bones of the pigs fed rock phosphate was 50 per cent less than that of pigs fed limestone or bone meal, and sodium fluoride still further reduced the breaking strength. There was no marked difference in the ash content of the femurs in the different lots, nor in the calcium and phosphorus content of the ash. Fluoride analysis showed that this element was present in amounts proportional to the amount fed.

[Experiments with swine at the South Dakota Station] (*South Dakota Sta. Rpt. 1929, p. 9*).—The results of three experiments, in continuation of those previously reported (E. S. R., 61, p. 61), are briefly noted.

How can soybeans be fed with corn to avoid soft pork.—Soybeans fed with corn or with a mixture of corn and barley made an unpalatable ration for pigs. It was unsatisfactory also for promoting growth, even though the protein content of the ration was practically equal to that of a corn and tankage ration.

Feeding spring pigs on rape pasture.—In studies with spring pigs on rape pasture it was found that ground barley had 86 per cent the feeding value of corn when supplemented with tankage. Limiting the amount of tankage was a more economical practice than self-feeding.

Wintering brood sows.—The birth weight of pigs produced by sows on a ration of ground oats, alfalfa hay, salt, and minerals was less than the birth weight of pigs produced by sows receiving barley or corn plus tankage, alfalfa hay, salt, and minerals. The pigs produced by the sows on ground oats were also weaker at birth. Adding potassium iodide to the salt of the ground oats fed sows increased the weight and strength of the pigs slightly.

[Experiments with swine at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 33, 103, 104, fig. 1*).—The results of two studies are briefly noted.

Will copper improve the hog ration?—E. B. Hart, C. A. Elvehjem, G. Bohstedt, and J. M. Fargo fed 30 gilts from weaning time on a ration of corn, skim milk, and salt. Some of the animals received copper and iron in varying amounts, with a check lot receiving no supplement. Hemoglobin analyses were made at frequent intervals, but no differences were apparent in any of the lots. The results indicate that copper and iron are not necessary for a normal hemoglobin level in growing and mature hogs fed a normal ration.

Feeding scabbed barley.—Feeding studies by Bohstedt, B. H. Roche, and J. G. Dickson showed that pigs react unfavorably to scabbed barley. When pigs were fed a dry-lot mixture containing 60 per cent of badly scabbed barley they vomited when first started on the feed and later did not consume enough to maintain their weight. As little as 30 per cent of such barley in a mixture caused pigs to lose in weight.

Growth studies with swine, J. H. Longwell, H. O. Henderson, and W. M. Insko, Jr. (*West Virginia Sta. Bul. 230 (1930), pp. 24, figs. 18*).—Continuing this study (E. S. R., 59, p. 163), the results of 4 years' work are reported. These results indicate that butter and oleomargarine are equally effective in preventing the appearance of rickets in pigs for a period of 126 days, but that vegetable oil margarine permits rachitic symptoms to develop in from 100 to 110 days.

Discover causes of "seedy-cut" in pork (*Wisconsin Sta. Bul. 410 (1930), pp. 61, 62*).—In a study, by L. J. Cole, J. S. Park, and A. Deakin, of the factors causing "seedy-cut" in the bellies of sows slaughtered for curing purposes, it was found that all tissue of this character is in the mammary gland. The black "seed" consists of granular pigment identical with the skin pigment in black and red breeds, but it does not occur in the white breeds of swine.

Red "seed" was found to be directly related to the sexual development and lactation activity of the sow. Thus immature sows do not produce this type of seed. The red "seed" is particularly prevalent in mature sows slaughtered during the heat period.

[Poultry studies at the Ohio Station] (*Ohio Sta. Bul. 446 (1930), pp. 145–148*).—The results of several experiments are noted.

Oats for layers, D. C. Kennard and R. M. Bethke.—Continuing this study (E. S. R., 61, p. 463), the average of two tests is reported, in which 5 lots of 50 White Leghorn pullets each were used. The all-mash method of feeding was followed, and oats replaced a like amount of yellow corn. Lot 1 received 20 per cent of finely ground oats, lot 2 20 per cent of whole oats, lot 3 20 per cent of germinated oats, lot 4 12 per cent of oats without hulls, and lot 5 a basal ration. There was little difference in the mortality rate in any of the lots. The average egg production per bird for 50 weeks in the respective lots was 140, 133, 135, 131, and 116 eggs.

Effect of different minerals on the growth of chicks, R. M. Bethke and D. C. Kennard.—In this study chicks were fed for 8 weeks on a basal ration of yellow corn, wheat, wheat bran, soybean oil meal, dried buttermilk, salt, and cod-liver oil, supplemented with different minerals on the same calcium basis. Chicks receiving fertilizer gypsum, steamed bone meal, or high magnesium limestone made the best growth, followed in order by high calcium limestone, powdered oyster shells, and precipitated calcium carbonate. Superphosphate was found to be very unsatisfactory.

Protein studies with chicks, R. M. Bethke and D. C. Kennard.—The proteins of soybean oil meal and meat scrap were found to be less efficient for growth of chicks up to 8 weeks of age than the proteins of dried buttermilk. However, 75 per cent of the total milk protein could be replaced with a like quantity of soybean oil meal or meat scrap protein without materially affecting growth or mortality.

Antirachitic properties of egg yolks, R. M. Bethke and W. Hosack.—Egg yolks from birds fed cod-liver oil or irradiated ergosterol or exposed to sunlight through Cel-O-Glass had from 5 to 10 times as much vitamin D as the yolks of eggs from birds fed the same basal ration but confined behind window glass. The vitamin D content of the eggs of the latter birds decreased as the length of confinement increased, but no decrease was found in case of the other lots.

Nutritional factors affecting hatchability of eggs, R. M. Bethke, D. C. Kennard, and C. H. Kick.—Continuing this study (E. S. R., 61, p. 463), it was found that adding the ash of alfalfa leaf meal did not increase the hatchability of eggs. Hens fed a ration including alfalfa leaf meal, but no cod-liver oil, and confined behind window glass laid eggs with a hatchability of 30 per cent, but when tested cod-liver oil or irradiated ergosterol was added production and hatchability were doubled. Replacing the window glass with Cel-O-Glass also had a favorable effect upon production and hatchability.

[Poultry studies at the South Dakota Station] (*South Dakota Sta. Rpt. 1929, pp. 10, 28*).—The experiments with poultry have been continued (E. S. R., 61, p. 62).

Comparative metabolism of several calcareous materials in poultry feeding.—Preliminary results in this cooperative study of the chemistry and poultry divisions indicate that lack of calcareous material in the ration reduces the strength of the eggshell and decreases production. The source of calcium influences egg production and eggshell strength, and indirectly the strength of bone. Oyster shell was as good a source of calcium as any material tested.

Ventilation of poultry houses.—Proper insulation has been found to be as important as good ventilation for poultry houses. While condensation of moisture is reduced with rapid changes of air, in thoroughly insulated houses it was not necessary to speed up circulation to as great an extent as in poorly insulated houses.

Alfalfa feeding.—Feeding cut green alfalfa to laying birds in pens was not satisfactory since it wilted quickly, and then hens did not consume it readily.

Alfalfa meal, however, gave excellent results both from the standpoint of production and hatchability. Mashes containing from 10 to 15 per cent of alfalfa meal proved effective.

White v. yellow corn.—Hens receiving yellow corn in scratch and mash laid 25 per cent more eggs, consumed less mash, and ate the same amount of scratch as hens receiving white corn.

[Poultry studies at the Wisconsin Station] (*Wisconsin Sta. Bul. 410* (*1930*), *pp. 37, 38, 73, 74*).—The results of several experiments are noted.

Parathyroid extract does not cure rickets.—E. B. Hart and H. T. Scott were consistently able to increase the calcium content of the blood of chickens by injections of extracts of normal parathyroid glands, but were unable to improve the deposition of calcium in the bones.

Crooked breastbones of poultry believed due to vitamin lack.—J. G. Halpin and C. E. Holmes examined a group of 480 pullets, 5 months of age, and only 1 pullet was found to have a crooked breastbone. The pullets were divided into lots and fed the same ration in the laying house for 7 months with varying amounts of vitamin D available. Only 13 per cent of the birds receiving sunlight on bright days and irradiated daily developed crooked breastbones. In a lot receiving 5 per cent of cod-liver oil, 25 per cent had slightly crooked and 11 per cent very crooked breastbones. Of the breastbones in a lot receiving their vitamin D from open windows only, 21 per cent were slightly and 21 per cent very crooked, while more evidence of crooked breastbones was shown in the lots receiving sunlight through glass substitutes. The lot kept behind ordinary window glass showed 25 per cent with slightly and 71 per cent with very crooked breastbones.

Optimum calcium and phosphorus ratio learned for growing chicks.—Scott, Hart, Halpin, and Holmes found that chicks raised in the early spring made the best growth when the ratio of calcium to phosphorus was 2 : 1. However, when adequate sunshine or other satisfactory sources of vitamin D were present, the chicks made optimum growth in both live weight and skeleton when the ratio was varied between 4 : 1 and 3 : 2.

Copper and iron supplements not needed in poultry ration.—Repeated tests by C. A. Elvehjem, Hart, Halpin, and Holmes have shown no beneficial effect from adding copper and iron to the ration of young chicks. Feeding these supplements to hens did not increase the copper or iron content of the yolk or white, nor did they influence the hatchability of the eggs.

Factors influencing egg production.—I, The influence of maturity upon egg production in S. C. White Leghorns, C. W. Knox (*Iowa Sta. Research Bul. 119* (*1930*), *pp. 309–332, figs. 20*).—In this study the records of 150, 223, 120, and 191 Single Comb White Leghorn pullets in 4 successive years were analyzed statistically. The data for each year were divided into frequency distributions and the relation of maturity to winter egg production, to spring egg production, and to total annual production, and a summary was made of the 4 years for each group of data.

For all 4 years a consistent correlation was found to exist between early maturity and high winter egg production. The maximum winter egg production was obtained when the birds matured in less than 220 days. Practically no relationship was found between maturity and spring egg production, while great variation existed from year to year in the relation of maturity and total egg production. For White Leghorns it was found that in order to secure maximum total egg production the birds should mature in from 160 to 210 days.

The effect of inadequate rations on the composition of the blood and of the bone of chicks, A. G. Hogan, C. L. Shrewsbury, and H. L. Kempster (*Missouri Sta. Research Bul. 124 (1929), pp. 17*).—Continuing the study of inadequate rations (E. S. R., 62, p. 461), an effort was made to determine the nature of the deficiency produced by synthetic diets. Blood and bone analyses were made of chicks on synthetic rations, on normal rations, and on rations varying in vitamins A, B, or D.

The analyses of the chicks on rations deficient in vitamin A were normal. A ration deficient in vitamin B apparently raised the level of blood sugar, while a ration deficient in vitamin D caused a decrease in the ash content of the bones. Since the blood sugar of chicks on synthetic rations was high, it was deemed possible that such rations were deficient in one or more factors of the vitamin B complex.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Ohio Station] (*Ohio Sta. Bul. 446 (1930), pp. 114–128, figs. 3*).—The results of experiments, many of which are continuations of work previously noted (E. S. R., 61, p. 465), are reported.

"Predigesting" feeds, C. C. Hayden and C. F. Monroe.—A ration consisting of equal parts of corn stover and alfalfa hay run through a cutter and a grain mixture of corn, oats, wheat bran, and linseed meal were mixed in the proportion of 180 lbs. of roughage to 112 lbs. of grain. This mixture was placed in a wooden tank, soaked and steamed, divided into two parts, and allowed to cool to about 140° F. Dimalt, a malt extract containing diastase, was added to one part, and both parts were allowed to cool for 12 hours. The portions were fed in alternate periods of 11 and 8 weeks to 2 lots of 5 cows each.

Comparing the periods on malted feed with the periods on feed not malted, there was an average increase of 2.26 per cent in milk production, 2.07 per cent in fat production, and 1.52 per cent in feed consumption. These results indicate that the malted feed is a little more palatable and slightly better utilized, but that the difference is not significant.

Protein studies, A. E. Perkins.—A comparison was made of the composition of the blood, milk, and urine of the cows in the high and low protein groups. The urea content of the blood of the cows receiving the high protein ration averaged about 15 times higher than that of the cows on the low protein ration. The urine from the low protein group contained only very small amounts of urea, while the average urea excreted in 24 hours by the high protein group was the nitrogen equivalent of 2.5 lbs. of protein. Ordinary milk analyses showed no change in composition in the two groups, but when the nonprotein filtrate was studied it was found that the concentration of the nonprotein nitrogen constituents was practically the same as in the blood of the animals producing the milk.

A practical protein test, A. E. Perkins and M. A. Bachtell.—At the Hamilton County Experiment Farm the herd was divided into two groups and fed during alternate 6-week periods a grain mixture containing either 10 or 30 per cent of a high protein supplement. Only the records of the cows which continued milking throughout the two periods were considered. The results indicate that the high protein ration was desirable for fresh cows and heavy producers, while the one of lower protein content was more economical for cows of lower producing ability and during the latter part of the lactation period.

Manamar for dairy cattle, C. F. Monroe, W. E. Krauss, and W. Mahan.—To determine the value of Manamar, a proprietary feed consisting of fish meal, kelp, limestone, and salt, 2 lots of 4 Jersey heifers each and 2 lots of Holstein heifers were fed the same basal ration except that for 1 lot of each group 10 per cent of Manamar replaced a like amount of linseed meal. Over a period from January 1 to November 1 there was no significant benefit derived from the feeding of Manamar.

One-half of the Belmont County Experiment Farm herd was fed Manamar, and an analysis made of a 2-day composite sample of the milk of these cows gave an iodine content of 0.17 mg. per quart. No iodine was found in the milk of the control group.

Fish meal and kelp for cows, C. F. Monroe and M. A. Bachtell.—At the Trumbull County Experiment Farm, one-half of the herd received a ration containing 5 per cent of fish meal and 3 per cent of kelp. The milk of these cows showed an iodine content of 0.33 mg. per quart, while that of the check group showed 0.04 mg. per quart.

The vitamin D content of Manamar, W. E. Krauss and C. F. Monroe.—A study of the ash content of the femurs and the inorganic phosphorus of the blood of rats fed rickets-producing rations to which was added Manamar, fish meal, or kelp showed that when Manamar was fed at a 10 per cent level the fish meal it contained furnished practically all the vitamin D.

The food value of milk affected by high and low protein rations, W. E. Krauss and C. C. Hayden.—In this study timothy hay was found to contain slightly more vitamin D than alfalfa hay, and no vitamin D was found in cane molasses when fed at levels up to 9 per cent of the ration. The difference in the vitamin D content of the milk from the two groups was of no nutritional significance.

Groups of rats were fed milk from the cows receiving the high protein, low protein, and normal rations with sufficient copper and iron added to prevent nutritional anemia. A slight advantage was evident in the growth rate of the rats on milk from the low protein group.

Supplementary value of yeast and other substances when added to milk, W. E. Krauss.—Of 10 samples of yeast, 7 showed definite hemoglobin regenerating power in varying degrees. Some correlation appeared to exist betwen the copper of the yeasts and their antianemic property, but no correlation was found with respect to iron. The addition of yeast to a ration had some beneficial effect on growth, but this was attributed to its vitamin B content. Cane molasses was an excellent antianemic substance, but beet molasses was of little value in this respect. Fish meal, kelp, and Manamar were found to possess no appreciable antianemic powers.

Antineuritic and antipellagric potency of milk, C. H. Hunt and W. E. Krauss.—In cooperation with the animal husbandry department, it was found that early pasture increased the vitamin G potency of milk but had no effect on the vitamin B content. The relationship between vitamin B and vitamin G in milk changed as the pasture season lengthened.

Effect of restricted rations on food value of milk for calves, W. E. Krauss and C. C. Hayden.—In this study as good calves were grown on milk from cows fed yellow corn meal and either alfalfa or soybean hay as calves grown on milk from cows receiving a normal ration.

Reproduction on exclusive milk diets, W. E. Krauss.—Rats grown on milk alone either died from nutritional anemia before reaching sexual maturity or were in such poor physical condition that they were inactive sexually. The addition of small amounts of copper and iron to the milk diet brought about sexual maturity and reproductive capacity and permitted a small portion of the young to be reared. The addition of wheat germ oil still further improved reproduction and lactation.

Effect of cow's ration on vitamin D content of butterfat, W. E. Krauss and C. F. Monroe.—No increase in the vitamin D content of the butterfat followed the feeding of Manamar to half of the cows at either the Belmont County or

Trumbull County Experiment Farms, as indicated by the ash content of the femurs and the inorganic phosphorus of the blood of rats fed the fat at levels of 0.4 and 0.8 gm. per head daily. Irradiated ergosterol was fed to a cow at levels of 5, 10, and 25 mg. per day, and the vitamin D content of her butterfat determined before and after this feeding. At the lower levels there was no improvement in vitamin D, but at the 25-mg. level there were some indications of a slight improvement.

Feeding iodine to dairy cows, C. F. Monroe.—Cows fed postassium iodide produced milk varying in iodine content from 0.3 to 0.7 mg. per quart, and on this basis from 4 to 8 per cent of the iodine fed appeared in the milk. The detectable iodine in the milk of 2 cows fed iodine for 1.5 years disappeared by the sixth day after such feeding was stopped. On the other hand, detectable iodine appeared on the second day in the milk of cows started on iodine, but did not reach the maximum until the tenth day.

The food value of iodized milk, W. E. Krauss and C. F. Monroe.—In this study 4 lots of rats were fed milk at the rate of 50 cc. per head daily plus copper and iron for 12 weeks after weaning. At this time they were killed and the thyroid glands removed and weighed immediately, then dried, weighed, and the iodine content determined. Lot 1 received normal milk, lot 2 normal milk plus 0.000025 gm. of iodine as potassium iodide, lot 3 milk from cows receiving 0.1 gm. of potassium iodide daily, and lot 4 equal parts of iodized and normal milk. The feeding of iodized milk resulted in smaller glands containing more iodine than those of rats receiving normal milk. Adding iodine directly to the milk produced the same results, but rats receiving this milk would not clean up their feed. A second trial of 8 weeks' duration gave practically identical results.

The hemoglobin content of the blood of cows, W. E. Krauss and C. C. Hayden.—Hemoglobin analyses of the blood of cows at different times of the year indicated that hemoglobin concentration was higher at the end of the pasture season than at the beginning.

A formula stating the relation between the quantities of fat and of protein in normal milk, A. E. Perkins.—Based on about 1,500 individual analyses of milk made at this station, together with published reports from other stations, the formula

$$\text{Percentage of protein} = 2.78 + [0.42\ (\text{percentage of fat} - 2.78)] \pm 0.25 \text{ per cent}$$

was derived, which should be useful in checking the purity of milk when its fat content is known, and in calculating the feed protein required for milk production.

Accuracy of composite milk samples, C. F. Monroe.—The average fat test of 290 composite samples was 5.13 per cent, while the fresh milk making up the samples tested on the average 5.22 per cent. The average error of samples measured into Babcock bottles and tested 1 week later was 0.04 per cent as compared with similar samples tested when fresh. The presence of preservatives in the bottles apparently had no effect on the tests.

[Experiments with dairy cattle at the South Dakota Station] (*South Dakota Sta. Rpt. 1929, pp. 13–15*).—Several experiments are noted in continuation of those previously reported (E. S. R., 61, p. 66).

Roughage grinding.—An increase of from 2 to 5 per cent in milk and fat production resulted from feeding ground roughage. However, this increase was not sufficient to pay the cost of grinding. Grinding did not increase the digestion coefficient of the roughage or of the entire ration. In this study grinding roughages did not appear necessary or economical for dairy cattle.

Percent of grain recovered in feces when whole grain is fed.—Whole corn and whole oats at the rate of 10 lbs. per head daily were fed to two dry cows, together with alfalfa hay as roughage fed at the rate of 1 lb. per 100 lbs. of live weight. The whole grains voided in the feces were separated, weighed, and analyzed. From 18 to 20 per cent of the whole corn fed was recovered in the feces, and very little of the nutrients had been removed from these kernels. The nutrients of the cracked kernels were all digested except the ash. The amount of grain which passed through the digestive tract untouched was greater for old cows than for young cows. This work indicates the value of at least breaking the hull of grains for dairy cows.

Influence of direct sunlight on the growth and health of dairy calves.—Heifers not exposed to direct sunlight have made somewhat faster gains and have sleeker hair coats than heifers exposed to direct sunlight. A part of this difference was probably due to cooler quarters and less annoyance from flies.

[Experiments with dairy cattle at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 32, 33, 35, 36, 79, 80, 81–83, figs. 3*).—The results of several experiments are noted.

Do calves become anemic in the suckling stage?—In this study by E. B. Hart and C. A. Elvehjem, calves fed a whole milk diet showed no indications of anemia, grew normally, and the hemoglobin content of their blood was the same as that of calves fed a ration including roughages and grain. A large reserve of copper in the liver is believed to permit the calves to continue building hemoglobin even when the ration contains no copper.

Science tries to aid dairy cows to utilize needed lime.—Continuing this study (E. S. R., 61, p. 168), Hart, H. Steenbock, O. L. Kline, F. Hanning, G. C. Humphrey, and G. Bohstedt found that feeding 200 gm. daily of irradiated yeast to 3 cows producing from 40 to 50 lbs. of milk per day did not improve calcium assimilation. This indicates that the ability of fresh green grass to promote lime assimilation is due to some other factor than its vitamin D content.

Feeding irradiated yeast increases vitamin D in milk.—Cows in the above study produced milk containing from 4 to 8 times as much vitamin D as normal milk.

Oat feed worth 40 to 70 per cent as much as wheat bran.—Continuing this study at the Monona Farm (E. S. R., 61, p. 169), four tests by Bohstedt, A. W. Lathrop, and F. B. Wolberg have shown that oat feed has 70 per cent of the feeding value of wheat bran when fed to dairy cows in amounts not exceeding one-fourth of the grain ration.

When fed at the rate of from 10 to 20 per cent in fattening rations for pigs and from 15 to 30 per cent for fattening steers and lambs, oat feed was worth from 40 to 50 per cent as much as corn or hominy feed. In small amounts it was sometimes worth more than 50 per cent, and in a number of cases with steers and pigs small amounts have increased the gains over those of the control lots.

Calves grow well on dried skim milk.—In a study by I. W. Rupel and Bohstedt, calves fed dried skim milk at the rate of 0.8 lb. daily made an average daily gain of 1.4 lbs. per head from birth to 6 months of age, as compared with 1.61 lbs. daily gain for calves fed 8 lbs. of fluid skim milk daily. The heifers fed dried skim milk were strong and well grown. When the dried skim milk was mixed in the grain ration after calves were 2 months old, the animals made as good gains as when fed the dried skim milk mixed with water until 6 months old.

Sweetclover makes poor showing with dairy heifers.—G. B. Mortimer and Rupel found over a 4-year period that a group of 5 dairy heifers made an average daily gain of 0.331 lb. per head on sweetclover pasture, while a similar lot made 0.727 lb. per head of daily gain on a mixed rotation pasture consisting largely of timothy with some alsike clover. Average gains over a 2-year period for heifers on a permanent pasture of bluegrass and redtop were 1.1 lbs. per head daily. Each acre of the respective pastures furnished the equivalent of 152, 157, and 176 days of annual pasture per heifer.

The effect of feeding different amounts of calcium and phosphorus upon the growth and development of dairy animals, H. O. HENDERSON and C. E. WEAKLEY, JR. (*West Virginia Sta. Bul. 231 (1930), pp. 56, figs. 15*).—In this study 4 groups of 8 calves each were fed rations similar in nutritive value but varying in the amounts of calcium and phosphorus. Lot 1 received a ration containing a legume hay as one-half of the roughage and a typical grain mixture which had been fed without apparent bad results and was assumed to have sufficient calcium and phosphorus. Lot 2 received a ration low in calcium, lot 3 low in phosphorus, and lot 4 low in both calcium and phosphorus. The heifers were weighed and their height at withers measured at weekly intervals. Detailed observations were made to determine abnormalities, general appearance, period of oestrum, and unnatural cravings. The blood was analyzed at 3-month periods for calcium and inorganic phosphorus, and 2 animals were slaughtered in each group at the end of 8, 13, 19, and 25 months for analyses of the long bones to test their breaking strength and to determine the internal condition of the animal.

The results show that growing dairy animals on rations low in calcium or calcium and phosphorus, but otherwise sufficient, grew about as well as normal-fed animals for some time, but over a period of 2 years did not attain the same weight or height at withers. The animals on low phosphorus rations grew as well as normal-fed animals over a 2-year period, even though the inorganic phosphorus content of their blood was below normal. It was easier to reduce the inorganic phosphorus content in the blood of growing animals than the calcium content by feeding deficient rations. Rations containing less than 0.2 per cent of phosphorus will decrease the inorganic phosphorus, while rations containing as little as 0.25 per cent of calcium do not affect the calcium content of the blood. Growing animals are not able to draw enough phosphorus from their bones to maintain the inorganic phosphorus of the blood.

The bones of animals fed rations containing less than 0.35 per cent of calcium or less than 0.2 per cent of phosphorus were low in ash but high in moisture and extractable material. The proportion of calcium and phosphorus in the ash of bone remained approximately the same regardless of the ration. Analyses of ribs, femurs, or humeri gave the same general results. In the group fed the normal ration the analyses of the bones were fairly representative of the composition of bones of normal cattle at various ages.

[Experiments in dairying at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 17, 18, 25–29, figs. 2*).—The results of several experiments are noted.

Saving time in the cleaning of milking machines.—In this study E. Holst and H. Dow, working under the supervision of E. G. Hastings, found that there were at least two types of cleaning devices with which milking machines could be kept in good chemical and bacteriological condition without taking them apart more often than once a week if hot water (190° F.) were available for flushing and rinsing the machines. Certain chlorine solutions proved effective, but because these solutions lose their potency on standing they should not be used more than once for milking machines. The rubber parts of the machine gradually accumulate material whether hot water or chlorine solutions are used, and for this reason should be taken apart once a week and cleaned with a hot solution of caustic soda.

Electric charges in milk found to have important influence.—H. H. Sommer and G. C. North found that fat globules in milk and cream normally carry a negative charge of electricity. Aging the milk, heating to 142° F., and adding calcium salts or iron chloride decreased the charge, while heating above 142° or adding sodium citrate or disodium phosphate increased the charge. When the electric charge of milk was decreased, the volume of the cream layer increased. The increase in the viscosity of aged pasteurized cream was due to a decrease in the charge of the fat globules, and the increase in viscosity following the addition of viscogen to cream was due to the decrease in charge caused by the calcium salts of the viscogen.

Whipping ability of ice cream mix is explained.—Continuing this study (E. S. R., 61, p. 171), Sommer and B. E. Horrall found that butterfat reduced the whipping ability of an ice cream mix, even when as little as 0.25 per cent of fat was present. The decrease was intensified as butterfat was added up to 4 per cent, but beyond this point there was no further decrease in whipping ability. Surface tension and viscosity were found not to be determining factors in the whipping ability of a mix.

The authors advance the following theory regarding the whipping properties of mixes: As air is whipped into the mix, the distance between the air cells becomes thinner and thinner until when more air is added some of the walls break down. The strength of these walls depends on the surface tension of the two surfaces and the cohesion of the liquid making up the mix. Fat globules weaken the walls because the milk serum does not adhere to the fat with a force equal to the cohesion of the serum, and large fat globules reduce the amount of serum in cross sections of the walls. This theory explains why homogenized mixes whip decidedly better than unhomogenized mixes, and why single stage homogenized mixes in which the small fat globules cluster do not whip as well as double stage homogenized mixes. Aging a mix allows a depositing of an absorption film on the fat globules, permitting better adhesion of the serum, and thus increasing whipping ability.

Freezing cheese does not impair flavor.—Determining the freezing point of cheeses (E. S. R., 59, p. 75), Sommer and G. Mutten found that Swiss, Liederkranz, and Camembert froze at about 21° F., Limburger at about 25°, and processed cheese, which has a uniform moisture content, at about 19°. The freezing injury to texture may be overcome by 6 weeks' storage at normal storage temperature subsequent to freezing. The flaking off of the paraffin coating was the most objectionable effect of freezing.

Improving the quality of process cheese.—H. L. Templeton and Sommer, in continuing this study (E. S. R., 61, p. 170), found that the best quality of processed cheese was obtained by mixing young and old cheese in the ratio of 2 or 3:1. Very old cheese is likely to contain small white particles, which remain unchanged during processing.

Processed cheese usually contained 1.1 to 1.8 per cent acid calculated as lactic acid and had a pH value of between 5.8 and 6.3. Changing the reaction gradually up or down caused the body of the cheese rapidly to become hard, but further changing rapidly decreased the strength of body. When the reaction approached neutrality the cheese tended to putrefy during storage, while the more acid cheese which had received the same heat treatment did not change. Aging had no marked effect on properly processed and stored cheese. Processing increased markedly the amount of water-soluble nitrogen as compared with the original cheese. Freezing seemed to have no effect on cheese to be processed.

Copper equipment injures milk and dairy products.—Sommer and H. Gebhardt found that the color and flavor of evaporated milk was impaired in direct proportion to the amount of copper present. Swiss cheese curd usually contained about 14 mg. of copper per kilogram. When milk was run through a separator most of the copper went into the cream. Any agitation of milk in a copper container increased greatly the amount of copper dissolved. The size of the area of copper exposed and the length of exposure also influenced the amount dissolved. Increasing the acidity of normal milk did not affect the solubility of copper, but heating up to 160° F. increased the amount, while above that temperature there was a marked progressive decrease. The dissolved gases of milk were associated with the amount of copper dissolved. When all the gases were removed the amount of copper dissolved decreased, and bubbling air or oxygen through the milk increased the copper solubility, but carbon dioxide decreased the solubility. Boiling milk previous to contact with copper reduced the amount dissolved, but previous pasteurization increased slightly the copper solubility.

Cream line studies of market milk, G. M. TROUT (*West Virginia Sta. Bul. 229 (1930), pp. 20, figs. 7*).—In an effort to determine the effect of agitation and pumping of milk upon the resulting cream layer and to determine the temperatures at which pumping had the most harmful effect on the depth of cream layer, samples of milk were taken from the raw milk at the university dairy after it had been thoroughly mixed, from the pasteurized milk before and after pumping at 145° F., and from the pasteurized milk pumped at 135, 125, 115, 105, 90, and 80°, respectively. The creaming tests were made in 100-cc. graduated cylinders, and the depth of the milk was approximately the same as that of a quart milk bottle. One sample of milk was creamed in ice water, one at 40°, and a third at 70°, and measurements of the depth of the cream layer were made after standing 2, 4, 6, and 24 hours. Fat determinations were made of the cream layer of each sample.

Creaming at ice water temperatures was more efficient for raw, pasteurized, or pumped milk than creaming at higher temperatures in air. The depth of the cream layer of milk creamed in ice water gradually shrank on standing, while that creamed at 40° increased in volume. The greatest depth of cream layer on raw milk creamed in ice water appeared after 6 hours, while that creamed at 40° did not reach maximum depth until after 24 hours.

Irrespective of the depth of cream layer there was an average of from 20 to 22 per cent of fat in cream obtained from gravity-creamed raw milk, pasteurized milk, or pasteurized-pumped milk. Pasteurizing milk in the usual manner decreased the creaming ability from 9 to 16 per cent, depending upon the temperature of creaming, and pumping at 145° further decreased the creaming ability from 2 to 5 per cent. Pumping pasteurized milk at 80 and 90° decreased the creaming ability, while pumping at temperatures between 115 and 135° slightly increased the creaming ability. Pumping at temperatures between 105 and 145° increased the rate of creaming regardless of the creaming temperature. Excessive agitation between 105 and 135° did not have any material effect on creaming ability.

Pumping raw milk at 60° and preheating to from 85 to 90° decreased the creaming ability about 9 per cent. Clarification of preheated raw milk had little effect on creaming ability, but pasteurizing pumped clarified milk in a coil-vat or glass-lined pasteurizer further decreased creaming ability to about 14 per cent.

Keeping qualities of butter, VI, VII, G. L. A. RUEHLE (*Michigan Sta. Tech. Bul. 102 (1930), pp. 46*).—In concluding this study (E. S. R., 39, p. 78) the results are published in two parts.

VI. *Experiments on the production of metallic flavor in butter and milk.*—In this phase of the study, which was rather limited in extent, results were obtained which indicated rather definitely that metallic flavor may be imparted to milk and butter by the presence of iron or copper lactate and by the products of decomposition of proteins whether these latter are added as such or produced by the presence of bacteria or their enzymes. The flavor due to metallic salts is quite apt to change to a tallowy or other undesirable flavor, while the flavor due to bacteria remains indefinitely or becomes more pronounced. Of the two, the off-flavor due to metallic salts is the more serious since the succeeding flavors are most often more disagreeable than the metallic flavor.

VII. *The microbic flora of off-flavored butter.*—The results of this phase of the work proved that microorganisms could produce off-flavors in milk. Such flavors as metallic, kerosene, woody, and weedy were produced by bacteria, and such other flavors as pecan, nutty, fruity, and vomitus were produced by microorganisms in this study. It was found that the presence of *Streptococcus lactis* in association with other organisms often intensified the flavor, but frequently lessened it or changed it entirely. These results demonstrate that the inoculation into fresh milk or butter of organisms isolated from off-flavored butters is quite apt to produce off-flavors identical with or similar to those present in the original butter.

Appended (pp. 31–46) is a description of the microbes isolated in this study.

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[Work with diseases of livestock at the Ohio Station] (*Ohio Sta. Bul. 446* (*1930*), *pp. 133–136, 150–153, 155, 156, fig. 1*).—In work with stomach worm infestation of lambs by D. S. Bell and Warwick regular monthly treatments with copper sulfate solution proved 97 per cent effective.

Tests of the comparative value of the agglutination and pullorin methods for the detection of pullorum disease by B. H. Edgington and A. Broerman were conducted at Reynoldsburg, the details of which are presented in tabular form. The evaluation of the tests was based upon cultural findings of chicks that were hatched from eggs of the reacting hens. The double intradermal test, devised by Holtum (E. S. R., 60, p. 271), for the detection of infectious abortion of cattle, was used by the same authors on 85 cattle in 5 herds, and found to incriminate a larger percentage of noninfected animals than the agglutination test, although it failed to detect some animals that were infected.

Work by Warwick and Bell suggests that fall lambing may be one means of avoiding parasite losses among lambs. It is concluded by Warwick that the sheep nodular worm larvae invaded the intestinal walls of cattle and produced some damage, but could not reach complete development because the host was an unnatural one. Coccidiosis in lambs was under observation by Warwick and Edgington. Work in dehorning Merino rams with caustic soda or potash pencils by Warwick has shown that there is an element of danger if the application is made too soon after the lamb is born. Application of the caustic tended to make the lamb temporarily indisposed and should not be applied until the lamb is nursing well without aid.

In tests made at the station by Warwick and H. A. Runnels with the roots of waterhemlock by dosing sheep and swine by means of gelatine capsules death was produced in both.

[Work with diseases of livestock at the South Dakota Station] (*South Dakota Sta. Rpt. 1929, pp. 11, 27*).—A preliminary survey made of the so-called alkali disease indicates that it affects an area equal to 30 per cent of the entire State. A few autopsies on afflicted animals showed that in addition to the loss of hair and hoofs the normal bone structure is also affected and possibly some of the organs.

In a study of the properties of oil of chenopodium, a good quality and yield was produced from cross-fertilized plants. Preliminary work in which various concentrations of the oil were used showed it to have a high anthelmintic value.

[Work with diseases of livestock at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 63–70, figs. 3*).—Work conducted with a view to determining the influence of nutrition on resistance to contagious abortion was carried on with two groups of a herd of 44 grade Holstein heifers, one being fed a poor ration and the other a good ration. The good ration used in the experiment did not increase resistance to contagious abortion infection, nor did the poor ration increase susceptibility. There is no indication at present that feed will control the disease, or that resistance to it can be increased by building up the mineral or other nutritional reserves of the animal. Cod-liver oil has no place in the ration as it markedly affects the butterfat content of the milk.

Comparative tests made by F. B. Hadley and M. C. Hawn showed conclusively that the new rapid method of detecting contagious abortion is not only as accurate as the slower old method of making the agglutination test and the complement fixation method, but has the important advantage of greater simplicity and requires a very much shorter time. As a result it has been adopted for routine testing work at the station. The important consideration is that the antigen used in the test should be prepared from cultures of *Brucella abortus* of high agglutinating value.

Milk of cows that had been fed *B. abortus* organisms but had not aborted was proved to contain *B. abortus* bacteria, thus demonstrating that the udder may become infected before abortion occurs. Milk thus may act as a carrier of infection even though the cow producing it has not aborted. Such cows, however, usually react to the blood test and can thus be identified. The finding that the presence of agglutinins specific for *B. abortus* in the blood serum of cows is not sufficient evidence that the animals are shedding the organism in their milk is considered significant.

In a continued study by Hadley (E. S. R., 61, p. 173) of the disease of foxes known as epizootic encephalitis, a preparation made from the brains and spinal cords of foxes in an advanced stage of the disease was made in which all the germ life was destroyed by the addition of carbolic acid. Of the 15 foxes to which this preparation was administered 1 of 2 that were visibly sick at the time of treatment succumbed while the other as well as the 13 that were apparently well when treated continued so although they had been exposed. It is pointed out that growing foxes may have rickets, and that fox pups so affected show marked rapid improvement when cod-liver oil, lettuce, fresh milk, and eggs, all of which contain vitamin D, are added to their ration.

A study was made by Hadley and C. R. Strange of coccidiosis in young rabbits, the most common source of death among them in Wisconsin. The observance of strict sanitary measures as a means of prevention has given the best results in combating it. The practice long followed by successful rabbit raisers of separating the young animals from the old as soon as possible and of quarantining all stock from other rabbitries was found effective in preventing and controlling the disease.

In work with pullorum disease, or bacillary white diarrhea, by B. A. Beach, Strange, C. E. Holmes, and J. G. Halpin, encouraging results were obtained from a new type of pullorin as a means of detection, over 91 per cent of the infected hens thus tested having reacted.

Reports on the veterinary department for the years 1927–28 and 1928–29, W. P. B. Beal et al. (*Gold Coast Vet. Dept. Rpts. 1927–28 and 1928–29, pp. 56*).—These are the usual annual reports (E. S. R., 52, p. 881).

Poisonous plants of South Africa, I, II, S. M. Stent and H. H. Curson (*Union So. Africa Dept. Agr. Buls. 48 (1929), pp. 9, pls. 3; 49, pp. 7, pls. 3*).—The first of these two accounts deals with "tulp," a general term including species of the Iris family representing the genera Homeria and Moraea; the second, on "slangkop" or snake's head, with those species of Urginea proved poisonous to stock.

The principles of bacteriology and immunity, W. W. C. Topley and G. S. Wilson (*London: Edward Arnold & Co., 1929, vols. 1, pp. XVI+587+XVI, figs. 171; 2, pp. VIII+589–1300+XX, figs. 71*).—In the first volume, part 1 deals with general bacteriology (pp. 1–233) and part 2 with systematic bacteriology (pp. 235–587). In the second volume, part 3 deals with infection and resistance (pp. 589–786) and part 4 with the application of bacteriology to medicine and hygiene (pp. 787–1300).

The zone phenomenon in agglutination tests, R. R. Spencer (*Jour. Infect. Diseases, 46 (1930), No. 2, pp. 138–147*).—In studies made of a serum which agglutinated *Brucella abortus* in high dilutions and showed an unusual middle zone of inhibition, this middle zone could be transferred to other positive abortus sera but not to antityphoid sera, suggesting that the zone phenomenon is a specific reaction. A later specimen of serum from the same patient, however, gave a wide prezone which could not be transferred to other anti-arbortus sera. The presence or absence of the zone was controlled by the temperature at which the agglutination test was incubated.

"These tests serve to emphasize the great difficulty in making trustworthy generalizations covering even a single antigen-antibody reaction (agglutination), since the knowledge concerning the nature of such immune reactions is still so incomplete."

Brucella abortus infection in man: A clinical analysis of thirty-five cases, A. S. Giordana and R. L. Sensenich (*Jour. Lab. and Clin. Med., 15 (1930), No. 5, pp. 421–436, figs. 6*).—A clinical study of 35 patients infected with *B. abortus*, here reported upon, suggests that it tends to run a clinical course somewhat at variance from that of *B. melitensis* infection.

The pathogenicity of abortion vaccines for guinea pigs, J. P. Torrey and E. T. Hallman (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 1, pp. 7–16, figs. 4*).—Abortion vaccines received from nine manufacturers were studied at the Michigan Experiment Station for viability and virulence. The cultural data indicate that three were nonviable although tested 20, 72, and 76 days, respectively, before the expiration date stamped on labels. A fourth vaccine failed to grow except for a few colonies on carbol-fuchsin agar, indicating that the vaccine contained a few viable organisms. The virulence tests with two of these four indicate that they contained a few viable, virulent organisms. The five remaining vaccines were viable, although two of these appeared to be highly attenuated but not nonvirulent. One of the two apparently attenuated vaccines was shown to consist of organisms possessing the property of acquiring considerable virulence when subjected to favorable conditions for the organisms. Three vaccines showed more virulence for guinea pigs than many recently isolated strains from aborting cattle.

It is noted that the number of organisms recommended per dose by the manufacturers varies from 200,000,000,000 for one of the most highly attenuated vaccines to 1,200,000,000,000 for one of the most virulent vaccines.

Use of live vaccines as a preventive of abortion in cattle (*Jour. Amer. Med. Assoc., 94 (1930), No. 12, pp. 873, 874*).—This is a brief review presented in connection with a list of six references to the literature.

The 1929 outbreak of foot-and-mouth disease in southern California, J. R. Mohler and R. Snyder (*U. S. Dept. Agr., Misc. Pub. 68 (1930), pp. 16, figs. 10*).—This is an account of the ninth outbreak of foot-and-mouth disease to occur in the United States and the work undertaken in its eradication.

Johne's disease (paratuberculosis) of livestock, E. Lash and W. M. Mohler (*U. S. Dept. Agr. Circ. 104 (1930), pp. 8, figs. 2*).—This is a practical account of this disease of livestock, means for its control, differential diagnosis, and history of an affected herd.

Malta fever in the United States, C. W. Wainwright (*Bul. Johns Hopkins Hosp., 45 (1929), No. 3, pp. 133–171, figs. 2*).—A summary of information on this disease, including six case reports. It is pointed out that the American incidence of *Brucella melitensis* infection is confined to the goat-raising areas, while *B. abortus* infection is general and widespread.

Experimental studies with killed canine rabies vaccines, H. W. Schoening (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 1, pp. 25–33*).—The author finds the injection of rabies street virus into the muscles of the lumbar region to offer a satisfactory method of testing immunity against rabies in dogs. In the limited tests made, phenol-killed vaccines when tested for potency by artificial exposure appeared to be variable in their action. Some lots of vaccine appeared to offer a high degree of protection while others were lacking. Vaccines killed with chloroform, on the other hand, rendered test animals solidly immune to artificial exposure.

The sensitization of cattle to tuberculin by non-tubercle, acid-fast bacilli of bovine origin, E. G. Hastings, B. A. Beach, and I. Thompson (*Jour. Bact., 19 (1930), No. 1, p. 29*).—This is the authors' abstract of a paper presented at the annual meeting of the Society of American Bacteriologists, held at Ames, Iowa, from December 30, 1929, to January 1, 1930.

From the tissues of cattle which reacted to tuberculin, but in which no lesions of tuberculosis could be demonstrated by the authors on post-mortem examination, acid-fast bacilli were isolated which through injection into guinea pigs, rabbits, and fowls were proved not to be tubercle bacilli. Tuberculosis-free cattle injected with these cultures were found to be sensitized for periods varying from a few weeks to at least 9 months to tuberculin injected intradermally or subcutaneously.

An experimental study of drugs stimulating the motility of the ruminant stomach, R. S. Amadon (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 1, pp. 65–74*).—The author's findings in studies of certain drugs commonly used as ruminatorics, aimed at a determination of the degree of any stimulant action, are based upon a study of graphic records of ruminoreticular motility.

It was determined that drug stimulation affects principally the strength rather than the frequency of the gastric movements. "Tartar emetic (120–150 grains), well diluted with water, gave excellent results. Barium chloride is apparently of little value as a ruminatoric. Eserine salicylate in doses of ½ and ¾ grain produced the most powerful motility observed during this study. Two administrations one hour apart were found to be particularly efficient. Arecoline hydrobromide was very efficient in doses of 1/16 and ⅛ grain. Administrations of ¼ grain and above cause depression of gastric motility for three-quarters to one hour. Pilocarpine hydrochloride failed to exhibit more than mild stimulation in 1-grain doses. Depression appears with 1½ grains. Lobe-line sulfate was found to be quite variable in action, and with pilocarpine may be classed as one of the weaker ruminatorics."

Enzootic cirrhosis of the liver of the bovine: A plant intoxication induced by ingestion of Senecio aquaticus Huds. and S. jacobaea Lin. [trans. title], H. JALVING (*Tijdschr. Diergeneesk., 57* (*1930*), *No. 5 pp. 328–342, figs. 6; Ger., Eng., Fr. abs., pp. 341, 342*).—This is an account of the condition produced by the ingestion of *S. aquaticus* and *S. jacobaea*, which grow quite commonly in pastures in the Netherlands. Incipient cirrhosis of the liver was found by the author in four healthy calves that were given a post-mortem examination from 84 to 114 days after having fed on Senecio.

Eimeria zürnii (Rivolta, 1878) as the cause of bovine coccidiosis in Brazil [trans. title], A. M. PENHA (*Rev. Soc. Paul. Med. Vet., 1* (*1929*), *No. 1, pp. 2–4, pls. 2; Eng. abs., p. 4*).—This is the first published report of a case of bovine coccidiosis observed in Brazil, where it is commonly known as red diarrhea.

Some experiments on the treatment of tick-infested cattle with arsenical dipping fluids, J. LEGG and J. L. FORAN (*Roy. Soc. Queensland Proc., 41* (*1929*), *No. 7, pp. 83–120*).—This is a report of dipping experiments with solutions of sodium arsenite for control of the cattle tick under field conditions in Queensland. The tick was found to be most resistant to treatment with arsenical dipping fluids during the last three or four days of its parasitic life.

Paratyphoid dysentery in lambs again, I. E. NEWSOM and F. CROSS (*Jour. Amer. Vet. Med. Assoc., 76* (*1930*), *No. 1, pp. 91, 92*).—Since the earlier report of studies of the outbreak of paratyphoid dysentery in feeder lambs by the Colorado Experiment Station involving 30,000 animals with a loss of 6.2 per cent (E. S. R., 53, p. 179; 54, p. 73), the repeated attempts by the authors made to isolate *Salmonella aertrycke*, the causative organism, from affected lambs have failed. During an outbreak of paratyphoid dysentery in lambs received from Texas in the fall of 1929, however, the organism was again isolated from two, the details of the findings being here reported. A railroad journey and difficulty in feeding appeared to be predisposing causes. The blood serum of recovered lambs agglutinated the strain isolated as well as the one from the previous outbreak.

A taxonomic study of Pseudomonas suis isolated from croupous pneumonia in swine, G. M. WOODS (*Philippine Jour. Sci., 41* (*1930*), *No. 2, pp. 181–213, pls. 6, figs. 6*).—A report of a taxonomic study of a microorganism isolated by W. H. Boynton from pneumonic lesions of hogs in the Philippine Islands. The name *P. suis* n. sp. is proposed for this organism, it not having been described previously. It is highly pathogenic for rabbits, guinea pigs, and mice, slightly so for pigeons, and very slightly pathogenic for rats.

Preliminary report on the relation of Bact. abortus Bang to fistulae, poll-evil, and other suppurations of horses, C. P. FITCH, A. L. DELEZ, and W. L. BOYD (*Jour. Amer. Vet. Med. Assoc., 76* (*1930*), *No. 1, pp. 17–24*).—This is a contribution from the Minnesota Experiment Station in which, following a review of the literature, the authors report upon investigations conducted. Details of the work are given in tables on (1) pyogenic localization of Bang infection in horses as reported by Rinjard and Hilger (E. S. R., 61, p. 472), (2) the results of examinations of specimens from 46 cases of fistulas and poll-evil, and (3) the results of agglutination test with *Bacterium abortus* antigen of blood serum from 48 normal horses.

The findings in this preliminary study indicate that *B. abortus* is associated rather closely with poll-evil and fistulas of horses. In examinations made of specimens of blood and pus in cases of fistulas and poll-evil occurring in the

State positive agglutination titers were obtained in 42 cases, and *B. abortus* was isolated from 3 specimens of pus. It appears that this organism can not be found very long after the fistulas are invaded by the pyogenic group of organisms, thus corresponding to its behavior in the uterus of the cow.

The control of fowl pox in poultry, E. M. GILDOW, G. S. SCHILLING, P. MOORE, and C. E. LAMPMAN (*Idaho Sta. Bul. 168* (*1929*), *pp. 19, figs. 5*).—This practical summary of information on fowl pox includes experimental procedure by Gildow, based upon work at the New Hampshire Experiment Station (E. S. R., 62, p. 472), and field trials in Idaho by Schilling (E. S. R., 61, p. 874).

Pullorum disease (bacillary white diarrhea of chickens), J. R. BEACH and S. T. MICHAEL (*California Sta. Bul. 486* (*1930*), *pp. 31, figs. 6*).—This is a practical account based upon investigations conducted at the station and a review of the literature, 45 references to which are cited. The greater part of the work deals with control measures.

The authors find that "the systematic application of the serum agglutination test to breeding fowls and the prompt removal of reactors, combined with proper management and sanitation on the farms and in the hatcheries, provides the most effective and practical means for the prevention of pullorum disease in adult fowls and chicks. The slow or tube method and the rapid method for performing the agglutination are equally reliable. Repeated agglutination tests at intervals of from 1 to 2 months offer a reasonably certain means of eradicating pullorum disease from a flock in one season. It is believed that owners of infected breeding flocks would find this system of testing more worth while than annual testing. Any testing procedure to be successful must be accompanied by strict adherence to sanitary measures. The agglutination test made with whole fresh blood was not found to be a satisfactory substitute for the slow or rapid agglutination tests made with blood serum. The intradermal or 'pullorin' test in its present status is not a satisfactory means of detecting adult fowls with pullorum disease."

The reduction of nitrates to nitrites by Salmonella pullorum and Salmonella gallinarum, R. P. TITTSLER (*Jour. Bact.*, *19* (*1930*), *No. 4*, *pp. 261–267*).—In the studies conducted at the Pennsylvania Experiment Station both *S. pullorum* and *S. gallinarum* reduced nitrates to nitrites, no appreciable difference being found to exist between the strains. It is concluded that Witte's peptone is not suitable for use in a nitrate-peptone solution. A solution composed of 2 gm. of Difco peptone, 0.2 gm. of potassium nitrate, and 1 liter of distilled water is satisfactory for these species. Dimethyl-α-naphthylamine is superior to α-naphthylamine in testing for nitrites.

The control of pullorum disease, C. A. BRANDLY (*Vet. Med.*, *25* (*1930*), *No. 4*, *pp. 154–159*).—This is a contribution from the Kansas Experiment Station, in which the diagnosis, epidemiology, and prevention and eradication are considered in a practical way.

Capillaria annulata in quail, E. F. THOMAS (*Jour. Amer. Vet. Med. Assoc.*, *76* (*1930*), *No. 1*, *p. 95*).—A quail received by the Florida Experiment Station in September, 1929, for post-mortem examination was found to be infested by the roundworm *C. annulata* and the tapeworm *Davainea cesticillus*, the infestation with this tapeworm having apparently caused the death of the bird. It is pointed out that *C. annulata*, reported by Cram in 1926 for the first time in this country (E. S. R., 55, p. 778), has since proved to be fairly common in many of the domestic birds.

Diseases and parasites of silver foxes and appropriate treatments, J. E. SHILLINGER (*Jour. Amer. Vet. Med. Assoc.*, *76* (*1930*), *No. 1*, *pp. 75–80*).—In this account, presented under the headings of distemper, external parasites, and internal parasites, attention is called to the fact that the definite information available thus far shows that certain parasitic infestations are the only disease conditions of foxes that may be treated in the same way as with dogs. It is pointed out that extreme care must be exercised in the external treatment of foxes by dipping them in fluid preparations, since they may suffer from the shock alone as well as from the action of the drugs on their pelts and by a rather free absorption of the drugs through the skin.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1926, IV–VII (*U. S. Geol. Survey, Water-Supply Papers 624 (1930), pp. V+163, fig. 1; 625 (1930), pp. V+170, fig. 1; 626 (1930), pp. VI+228, fig. 1; 627 (1930), pp. IV+98, fig. 1*).—These parts present the results of measurements of flow made on streams in these basins during the year ended September 30, 1926, as follows: IV, St. Lawrence River Basin, prepared in cooperation with the States of Wisconsin, Illinois, Ohio, and New York; V, Hudson Bay and Upper Mississippi River Basins, prepared in cooperation with the States of Minnesota, Wisconsin, Iowa, Illinois, and Missouri; VI, Missouri River Basin, prepared in cooperation with the States of Montana, Wyoming, Colorado, Missouri, and Kansas; and VII, lower Mississippi River Basin, prepared in cooperation with the States of Missouri, Colorado, Kansas, and Texas.

Daily river stages at river gage stations on the principal rivers of the United States, H. C. Frankenfield (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 26 (1928), pp. II+290*).—This is the twenty-sixth of a series of daily river stages on the principal rivers of the United States (E. S. R., 60, p. 277), and presents data for 1928.

Contributions to the hydrology of the United States, 1929 (*U. S. Geol. Survey, Water-Supply Papers 636–A (1929), pp. II+14, figs. 3; 636–B (1929), pp. II+15–44, pl. 1, figs. 2; 636–C (1929), pp. IV+45–100, pls. 13, figs. 6; 636–D (1930), pp. VI+101–168; 636–E (1930), pp. VI+169–219; 636–F (1930), pp. VI+221–330, pls. 11, figs. 23*).—Six papers are here presented.

A. *Quality of water of the Colorado River in 1926–1928*, C. S. Howard.—This report gives the results obtained in a continuation of a study of the Colorado River (E. S. R., 59, p. 280). The analyses are presented in tabular form.

B. *Suspended matter in the Colorado River in 1925–1928*, C. S. Howard.—The results of this investigation indicate that the annual load of suspended matter in the Colorado River computed from samples collected at Grand Canyon was considerably larger than the average annual load computed from samples collected at Yuma. It was also found that for a considerable portion of the material a given weight will occupy a larger volume than has been assumed in recent estimates. For these reasons it is concluded that possibly some of the previous estimates of the volume of material that would be deposited in a reservoir have been too low.

C. *The New England flood of November, 1927*, H. B. Kinnison.—A description of this flood is presented.

D. *Surface water supply of the San Joaquin River Basin, California, 1895–1927*, H. D. McGlashan.—A summary is presented of the records of flow measurements made in cooperation with the State of California on streams in the San Joaquin River Basin of California from 1895 to 1927.

E. *Surface water supply of Pacific slope basins in southern California, 1894–1927*, H. D. McGlashan.—This report, prepared in cooperation with the State of California, presents a summary of the records of flow measurements made during the period from 1894 to 1927.

F. *Water-power resources of the Umpqua River and its tributaries, Oregon*, B. E. Jones and H. T. Stearns.—This report discribes the water-power resources of the Umpqua River Basin, and outlines a plan for their development.

The total potential power of the Umpqua River Basin without storage is 243,000 h. p. for 90 per cent of the time and 573,000 h. p. for 50 per cent of the time. With storage the total potential power can be increased to 354,000 h. p. for 90 per cent of the time and 549,000 h. p. for 50 per cent of the time. With unified operation the power available 90 per cent of the time could be increased in an average year to more than 400,000 h. p., of which 350,000 h. p. would be on the Umpqua and North Rivers, 15,000 h. p. on the Clearwater River, and 9,000 h. p. on Mill Creek.

Upper Colorado River and its utilization, R. Follansbee (*U. S. Geol. Survey, Water-Supply Paper 617 (1929), pp. XV+394, pls. 13, figs. 5*).—This report includes a preface by N. C. Grover, and presents in form for ready reference the available data pertaining to the present and future utilization of the surface waters of the upper Colorado River Basin, above the Green River, together with information relating to topography, climate, evaporation, water supply, transmountain diversions, storage, irrigation and agriculture, and water power as they existed in 1927.

Comparative strength properties of woods grown in the United States, L. J. Markwardt (*U. S. Dept. Agr., Tech. Bul. 158 (1930), pp. 39*).—This bulletin supplements but does not supersede Department Bulletin 556 (E. S. R., 37, p. 885). It gives data on weight, shrinkage, and strength of woods grown in the United States, including exact information for the comparison of the strength properties of many native species.

The kiln drying of southern yellow pine lumber, L. V. Teesdale (*U. S. Dept. Agr., Tech. Bul. 165 (1930), pp. 67, pls. 9, figs. 9*).—This bulletin presents briefly the general principles of kiln drying and illustrates the application of them to the kiln drying of southern yellow pine lumber. Specifically the purpose is to show (1) how to control drying conditions in the kiln, (2) the proper method of handling stock before and after kiln drying, and (3) the economic advantage of observance of proper kiln operation and handling methods.

Tests of large timber columns and presentation of the Forest Products Laboratory column formula, J. A. Newlin and J. M. Gahagan (*U. S. Dept. Agr., Tech. Bul. 167 (1930), pp. 44, pls. 4, figs. 7*).—Tests conducted in cooperation with the National Lumber Manufacturers' Association are reported.

The results of tests on large structural timbers, together with other test data, show that knots do not seriously affect the stiffness of timbers, columns, or joists. For structural members in which stiffness rather than strength is the controlling factor, such as posts in small dwellings, it is considered entirely safe to use knotty material.

It was found that in long columns, where stiffness instead of crushing strength is the controlling factor, the loss in strength on account of knots is relatively small as compared to that for shorter specimens. The loss would be negligible in long columns of the common grade having a slenderness ratio of 30 or more to 1, and in high-grade columns with a slenderness ratio of approximately 20 to 1.

The effect of knots on the strength of short columns is proportional to the reduction in cross-sectional area that would result if all the knots in any 6 in. of the length were removed from the cross section. A column with a slenderness ratio of 11 to 1 will sustain approximately the same load as a shorter column of the same cross-sectional area.

It was found that within the elastic limit of the material the best interpretation of the behavior of long columns is the Euler formula. The decrease in cross section of an Euler column, on account of seasoning, largely offsets the increase in strength which accompanies the seasoning.

The most practical expression of the behavior of intermediate columns appears to be the Forest Products Laboratory fourth-power formula. Southern yellow pine and Douglas fir columns of the type and grade tested are practically equal in strength.

A simple formula for computing accurately the strength of wooden columns used in buildings, bridges, and other structures is developed, and its application demonstrated in tests on 12 by 12 in. by 24 ft. timbers.

[Agricultural engineering investigations at the South Dakota Station] (*South Dakota Sta. Rpt. 1929, pp. 3–6*).—Studies of corn harvesting machinery showed that the optimum diameter of the husking roll is between 3.5 and 4 in., and the optimum length of husking roll for a stationary husker is from 36 to 42 in. The most satisfactory husking peg is a flat-headed stud. The optimum speed for husking rolls is 300 r. p. m. The optimum angle for the husking rolls in the bed is from 18 to 22°, and a machine allowing an adjustable angle to suit the moisture content in the husks of the snapped corn is desirable. One ear-retarder at the top of the husking bed is most satisfactory.

Combine investigations showed that the time that must elapse after the grain binder is started in a grain field and before it is safe to start combining the grain direct is from 10 to 15 days under normal conditions is eastern South Dakota. Grain was cut at intervals after it was sufficiently ripe to start the grain binder, beginning 2 days after such time. On the second day after oats were ready to cut with the binder combined oats contained 35.9 per cent of moisture, 5 days later 17.6 per cent, and 3 days later 14.2 per cent, when the oats were ready to combine direct, being sufficiently dry to store in a bin without danger from heating. This was 10 days after the grain binder could have started. In barley for this season the grain was ready to combine 14 days after it was ready to cut with the grain binder. Generally it is not safe to start direct combining grain until 10.30 to 11 o'clock in the morning under normal harvest weather conditions. In oats cut and threshed direct every hour, beginning at 8 o'clock, the moisture content dropped from 20.4 per cent at 8 o'clock to 14.4 per cent at 11 o'clock. The moisture content started rising again at 8 o'clock, or just at sunset.

Data also are summarized on the use of electricity in agriculture.

[Agricultural engineering investigations at the Wisconsin Station] (*Wisconsin Sta. Bul. 410 (1930), pp. 129–133, figs. 2*).—In experiments on feed grinding F. W. Duffee has found that hammer mills are much better adapted to farm requirements than burr mills where electric power is used. An improved feeding mechanism was developed which assures a constant and uniform movement of the unground grain into the mill. Special attention has also been given to the position, arrangement, and design of the elevating fan which elevates and transfers the ground grain to any location desired. It was found that the hopper bottom below the screen of the mill should have a slope of at least 60° if the ground grain is to slide over it easily and without clogging. The speed of the fan is determined by the intake requirements rather than the requirements for elevating the ground feed after it enters the fan. Preliminary tests of the speed of the fan for greatest efficiency showed that speeds of from 3,000 to 4,000 r. p. m., according to the design of the fan, seem to give the best results.

It pays to run the hammer mills at full capacity, as the efficiency increases rapidly as the rate of feeding is increased up to the capacity of the machine.

In silage cutter tests, Duffee showed that the cutter elevates the cut corn by throwing rather than by blowing. It was found that efficient elevating fans show the least air pressure, and that cutters designed on this plan require the least power to run them. Tests of shortened fan wings showed an increased mechanical efficiency, making possible a saving of from 5 to 15 per cent in the amount of power required.

A new hay harvester and a new plow for use in heavy brush land developed by the station are also described.

Construction of a sled-type cornstalk shaver, F. Irons (*U. S. Dept. Agr., Misc. Pub. 69 (1930), pp. 10, figs. 22*).—This shaver, which was developed by the division of agricultural engineering of the Bureau of Public Roads, is described and diagrammatically illustrated. Its chief advantages are its simple construction, light weight, light draft, low cost, and the possibility of placing two of the shavers abreast for cutting four rows of stalks at one time. It is especially adapted for use in connection with the European corn borer control.

Combine harvester investigation, E. A. Silver, G. W. McCuen, and [N. W.] Wilson (*Ohio Sta. Bul. 446 (1930), pp. 174–176*).—The results of tests of combines for harvesting wheat, oats, and barley are briefly summarized.

They indicated that the two greatest sources of waste came from the loss back of the cutter bar and the loss from threshing due to poor mechanical adjustments. The total machine loss ran from 0.4 to 10 per cent. The smaller percentage of loss was in a field of good standing wheat, and the largest was in a very weedy field of barley. However, this correlation did not always exist, as 9 and 7 per cent losses were found in two fields in which the crop was in excellent condition and free from weeds or other foreign material. The yields in these fields were 14 and 15 bu. per acre, respectively. The two combines that harvested these fields were found to be badly out of adjustment, especially as to slow cylinder speed. When the cylinder speed was raised from 820 to 1,010 r. p. m., the machine loss was reduced from 7.49 to 0.75 per cent.

The moisture content of the grain before and after combining showed a decided increase in the threshed grain except where the windrower and pick-up devices were used. The increase in moisture content of the threshed grain varied from 0.2 to 7.5 per cent, the amount of increase depending largely upon the amount of green material in the crop. Tests showed, however, that with all green material removed there is still a marked increase of moisture in the threshed grain.

In the test of the windrow-pick-up method, a 16-ft. windrower was used with a 12-ft. combine. These size units do not make a good combination because the tendency is for the operator of the combine to move the machine too fast to handle a 16-ft. windrow efficiently. However, with the ground travel of the combine reduced to a point where the machine was never overloaded, excellent results were obtained. Although the windrow suffered heavy rains before combining, the grain loss was negligible as compared with some of the tests on straight combining. The cutter bar losses were next to the smallest of any tests made, and there was no increase in moisture content of the threshed grain over that in the windrow before combining.

Remaking a semi-monitor poultry house, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 143 (1930), pp. 41–43, figs. 3*).—The reconstruction of a semimonitor type of poultry house to one with a combination type roof is briefly described.

Use exhaust steam in dairy plants, M. J. Buck and H. C. Jackson (*Wisconsin Sta. Bul. 411 (1930), pp. 12+[4], figs. 8*).—Technical information for use by engineers on the use of exhaust steam in dairy plants for such operations as heating boiler feed water, heating water for cleaning and pasteurizing, heating milk for the separator, heating driers for casein, and the like is presented.

The necessary equipment is described and illustrated, and a diagrammatic illustration of a dairy plant boiler room showing a practical arrangement for making efficient use of exhaust steam is included.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in rural economics at the Ohio Station, 1928–29] (*Ohio Sta. Bul. 446 (1930), pp. 165–173*).—Results of investigations not previously noted are reported on as follows:

Income and expenses of Ohio agriculture, V. R. Wertz.—A table is given showing by years, 1920–1928, the gross (also 1910–1919) and net cash income, cash expenses, value of home-produced food and fuels consumed on farms, and net income.

Disking v. *plowing for oats,* F. L. Morison.—Cost data collected in Medina County showed that oats seeded on a disked seed bed required 11.4 man hours, 12.4 horse hours, and 1 tractor hour per acre, yielded 34.2 bu. per acre, and cost $18.89 per acre, or 55 cts. per bushel, as compared with 16 man hours, 23 horse hours, and 0.8 tractor hour, 31.7 bu., and $21.89, or 69 cts., respectively, for oats seeded on plowed ground.

Livestock marketing G. F. Henning and W. B. Stout.—A table is included showing for 1926, 1927, and 1928 the gain or loss per 100 lbs. on hogs of different weights to farmers in different counties shipping direct to packers, as compared with the price obtainable at the Pittsburgh market. The average gains were 5.4 cts. in 1926, 11.9 cts. in 1927, and 23.2 cts. in 1928.

Effect of buying plan on butterfat content of milk, R. W. Battles and C. G. McBride.—A table is given showing by years, 1924–1928, the weighted average butterfat tests of representative milk shippers to Cincinnati, Canton, and Dayton, these markets using different buying plans.

Effect of various factors on sale price and tax valuation of farms, H. R. Moore.— A table is included showing the sale price and tax valuation per acre and ratio of tax valuation to sale price of 340 farms sold in 1927 and 1928. The farms are classified by productivity of soil, type of improvements, kind of roads, and distance to market. The data indicated a tendency to tax the farms with poor soil and poor improvements, on dirt roads, and far from market at a higher ratio.

Cost and standards of family living, C. E. Lively.—A table is given showing the net cash receipts and cash spent for family living on 111 Ohio farms in 1926 and 1927, grouped according to total receipts from all sources.

Movement of open country population, P. G. Beck.—Data gathered in 8 townships during a 3-year period showed that in the industrial section of the northeastern part of the State 16 per cent of the farm operators and 25 per cent of the farm home makers were children of nonfarm parents, as compared with 2.5 and 8 per cent, respectively, in the remainder of the State. In the northeastern section 80 per cent of the children of native white farmers had gone into nonfarm occupations as compared with 50 per cent in the other sections of the State.

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul. 143 (1930), pp. 60–64, figs. 2*).—Results are reported as follows:

Trends in sales and prices of Ohio farm products since 1910, V. R. Wertz (pp. 60–62).—A table and chart are included showing the annual indexes (1910–1914 = 100) of the quantity of farm products sold, farm prices, and the gross cash income from agriculture in Ohio, 1910–1928.

Ratio of poultry feed to the price of eggs and poultry, J. H. Sitterley (pp. 62, 63).—A table is given showing by years, 1920–1929, the average prices of eggs per dozen, poultry per pound, and poultry ration per 100 lbs. (45 lbs. of corn, 35 of wheat, 10 of oats, and 10 lbs. of meat scrap), and the equivalent in feed of 6 doz. eggs and 4.3 lbs. of poultry (chart also given).

Index numbers of production, prices, and income, J. I. Falconer (p. 64).—The table previously noted (E. S. R., 62, p. 677) is brought down through December, 1929. The old series of index numbers of cash income from sales is replaced by a revised series.

[Investigations in agricultural economics at the Wisconsin Station, 1928–29] (*Wisconsin Sta. Bul. 410 (1930), pp. 116–128, figs. 3*).—Results of investigations not previously noted are reported upon as follows:

[*Taxation for highways*].—In a study, made by J. A. Commons and B. H. Hibbard, it was found that the general property tax (largely on real estate) pays approximately 75 per cent of the expense of highways, while the State highway funds (gas tax, motor vehicle license, and Federal aid funds) cover less than 25 per cent of the costs of open country roads. The gas tax meets but one-fifteenth of the costs of the highways and streets. General bond issue financing was found to require 50 per cent of the receipts from the bonds for interest charges during the life of the bonds, and in many instances there was no relationship between the term of the bonds and the service life of the road construction so financed. A detailed study of a typical southern Wisconsin county showed the following as to the sources and expenditures of highway funds in 1927:

Sources and expenditures of highway funds in a typical southern Wisconsin county in 1927

Source of revenue	Spent on—			
	All roads	State trunk highways	County trunk highways	Local town highways
State funds:	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Gas tax	9	18	5	3.5
Automobile license	11	25	7	4.0
Federal aid	4	8	2	1.5
County and town funds:				
Farm property taxes	53	20	45	81.0
City and village taxes	23	29	41	10.0

In the above-mentioned county the percentages of population, property valuation, and automobile ownership were, respectively, for farms 34, 36.5, and 41.4; villages 10, 6.6, and 12.7; and cities 56, 56.9, and 45.9.

[*Milk marketing*].—A chart based on a study of the Madison market, made by R. K. Froker, is included showing by months, January to September, inclusive (average for 1927 and 1928), the percentage of producers producing from 1 to 25, 26 to 50, 51 to 75, 76 to 100, and over 100 per cent surpluses (production above the average for the preceding period, September to November, inclusive). An analysis of production showed that if the tolerance (amount above the base on which the pool price was received) were reduced from the present amount of 75 per cent to 50 per cent, only 13 per cent of the producers would be directly affected. An analysis of the records for 1927 of 225 producers showed that the average daily production was 195 lbs. per farm, that 87 farms produced only 20 per cent of the total production, and that 31 per cent was produced on 36 farms.

[*Economic study of cheese factories*].—A study made by H. H. Bakken, covering 182 typical American cheese factories in 12 counties, showed that over 80 per cent of the 132 factories reporting received less than 2,500,000 lbs. of milk annually, that on the average a separate factory is maintained for each 30 patrons, that the factories are approximately 2.5 miles apart, and that 23.5 per cent of the patrons hauled milk less than 0.5 mile and 48.5 per cent 1 mile or less. Monthly records of 3,972 patrons of 125 factories covering a 3-year period indicated only a slight relationship between the yield of cheese and the butterfat test of the milk. A wide range of differences was found in manufacturing costs, cheese yields, and prices received for cheese by factories doing a like volume of business. No less than 25 different bases of settlement between factories and cheese buyers were found in the 182 factories. Similar variations were found in the prices paid for whey cream.

In a study, made by B. W. Silcox and Bakken, of the foreign types of cheese factories, data for 1925, 1926, and 1927 were collected from 225 factories regarding operation, volume of business, costs, etc. Of these plants 83.8 per cent had only 6 to 20 patrons. Of the plants giving information, 201 were cooperatively owned, 166 were operated by farmers, 40 by dealers, and 18 by private operators.

Horse and tractor costs on Wisconsin farms.—An analysis of cost account figures, obtained by P. E. McNall and D. R. Mitchell, of 38 Fond du Lac County farms with tractors and 18 without tractors, showed the following for the two types of farms, respectively: Crop acres 97 and 78, cost of production per crop acre $17.28 and $16.70, man labor per crop acre 20 and 22 hours, number of crop acres per horse 24 and 19, hours per year worked per horse 825 and 869, cost per hour horse work 16 and 15 cts., equipment cost per farm $410.17 and $361.52, hours per year tractor used 242, and cost per hour of tractor power $1. On 11 Barron County farms with tractors and 10 without tractors the acres in crops were 71 and 53, cost of production per crop acre $15.34 and $15.68, man labor per crop acre 18 and 23 hours, number of crop acres per horse 23 and 16, hours per year worked per horse 683 and 755, cost per hour horse work 15 and 12 cts., equipment cost per farm $257.18 and $262.85, hours per year tractor used 147, and cost per hour of tractor power $1.03.

Large scale and corporation farming: A selected list of references, compiled by M. T. Olcott (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 30 (1929), pp. V+87*).—This is a mimeographed annotated bibliography of articles, both popular and giving results of research studies, on farms of unusual size for the particular type of farming in question, regardless of the type of ownership or of management. References to foreign publications are included. The following related subjects are not included: Agricultural machinery and mechanization of agriculture, tenancy, agricultural colonization, cooperative ownership of machinery, and cooperative credit societies. Only a limited number of historical references are given.

Cost reduction in dry-farming in Utah, P. V. Cardon (*Utah Sta. Bul. 215 (1930), pp. 27, figs. 10*).—Cost records from 40 Utah dry farms for the years 1926 and 1927 are analyzed. Tables and charts are given showing the investment in land, buildings, and equipment, the man labor and horse and tractor work requirements and their cost, the costs of different cultural operations and hauling, and the total expenses and income. Comparisons are made with costs in earlier years as found by other investigators. The relation of size of farm to cost of operation is discussed.

The farms studied averaged 313.2 acres in area. The average investments per acre were for land $42.42, buildings $4.44, and equipment $7.17. With horse outfits 5.96 man hours and 26.11 horse hours per acre, with a total labor acre cost (exclusive of hauling) of $5.85, were required. With tractor outfits 3.78 man hours and 2.82 tractor hours were required, with a total acre cost of $3.68. Hauling averaged 1 ct. per bushel per mile. The total average cost per acre of production was $16.67, the average gross income $25.09, and the net acre return $4.21 per year, being the equivalent to 7.8 per cent on the total investment. The costs of living of the farmer and his family are not included in the expenses.

Taxation of farm property, W. COOMBS (*U. S. Dept. Agr., Tech. Bul. 172 (1930), pp. 75, figs. 15*).—The research work on farm taxation carried on during the past 8 years by this Department and the State experiment stations, together with that of some other State groups, is summarized. An analysis is made of the relation of taxes to (1) income from cash-rented farms in 15 States, (2) income from urban property in 9 States, (3) income from owner-operated farms in 5 States, (4) assessed valuation and sales value of farm real estate, and (5) values of cash-rented and owner-operated farms. The kinds and amounts of taxes paid by agriculture, the trends in agricultural taxation, and the incidence and effects of farm taxes are discussed.

The taxes paid by farmers in the United States in 1927 are estimated at $901,000,000, derived as follows: General property tax 83.8 per cent, automobile license 5.5, gasoline tax 7.2, Federal and State income tax 1.7, Federal and State inheritance tax 1.1, and poll tax 0.7 per cent. The index numbers of farm taxes in the United States rose from 100 in 1914 to 106 in 1917, 246 in 1923, and 258 in 1927. The percentage of net rent on cash-rented farms taken by taxes in 14 of the States studied varied from 18 to 58 per cent, and, assuming these States to be representative of the United States, it is estimated that during the period 1922–1927 taxes took about 30 per cent of the net income of such farms. The studies of returns on farm property and on the owners' managerial abilities indicated that during the same period taxes amounted to from 18.5 to 31 per cent of such returns. Relationship between taxes and the estimated value of farm property showed wide variations from section to section of the country. In 1924 taxes were reported to have taken on an average of 1⅕ per cent of the value of farm real estate, and in 1927 it is estimated that they took probably 1⅛ per cent. Improvement in the assessment process was shown to be a prime requisite of any tax reform program. The studies showed that farm property is heavily taxed, and that it and other real estate and certain other classes of tangible property bore more than a reasonable share of the cost of local government.

Improvement of the administration of the present tax system, new types of taxes, a broader base of support of various governmental activities, and the reduction of expenditures through administrative economy and the elimination of duplication of governmental functions are suggested and discussed as possible methods of reducing taxes on farm property.

The agricultural outlook for 1930 (*U. S. Dept. Agr., Misc. Pub. 73 (1930), pp. 64*).—This is the eighth annual report prepared by the staff of the Bureau of Agricultural Economics, assisted by representatives of other bureaus of the Department and of the agricultural colleges, experiment stations, and extension services of the various States. World-wide and nation-wide supply, demand, and price facts regarding the various agricultural products are assembled with a view of showing the probable trend of conditions toward the time when the production in 1930 will be marketed.

Adjusting agricultural production and distribution in the Wheeling area to meet home market demands, W. W. ARMENTROUT (*West Virginia Sta. Bul. 228 (1930), pp. 28, figs. 10*).—This is the fourth report of the series previously noted (E. S. R., 62, p. 887). The same type of tables and explanatory notes are included for the Wheeling area. The period covered is June, 1925, to May, 1926.

Asparagus, H. R. WELLMAN and E. W. BRAUN (*California Sta. Bul. 487 (1930), pp. 41, figs. 21*).—Tables and graphs are given and discussed presenting information regarding asparagus acreage in the United States by States, amounts and trends of acreage and production in the Delta district of California, prices paid to growers for canning asparagus, exports of canned asparagus, seasonal variations and trends in car-lot shipments, unloads at important markets, and the variations in and factors affecting the price of table asparagus.

Practically all of the canning asparagus and about 45 per cent of the table asparagus produced in the United States was grown in California, and of the amount grown in California practically all of the canning asparagus and about 90 per cent of the car-lot shipments of table asparagus was grown in the Delta district. From 1922 to 1926 the bearing acreage in the Delta district increased 122 per cent, most of the increase being in the years 1925 and 1926. It is estimated that the bearing acreage in this district in 1931 will be 55,000 acres, as compared with 49,000 acres in 1926. The acreages in South Carolina and Georgia also increased 32 and 29 per cent, respectively, from 1926 to 1928. For the three years 1921–1923 the combined shipments from California, South Carolina, and Georgia to New York City averaged 517 cars, and the average combined price per crate in New York City was $5.90. For the three years 1927–1929 the combined shipments averaged 1,974 cars and the price $4.35 per crate.

The authors conclude that California may expect increasing competition from South Carolina and Georgia during the next few years, and that additional plantings of asparagus in California for fresh consumption alone are not warranted at the present time, except in particularly favorable localities.

The horse situation on New Hampshire farms, M. F. ABELL (*New Hampshire Sta. Circ. 31 (1929), pp. 4, figs. 2*).—This circular is based chiefly on replies from 263 men to a questionnaire sent out in July and August, 1929. The returns represent 625 horses. The supply, ages, and value of New Hampshire horses are briefly discussed. Charts show the average purchase price of horses in New Hampshire, 1910–1929, and the adjusted purchase price of horses in the United States, 1880–1929.

[Investigations in rural sociology at the South Dakota Station] (*South Dakota Sta. Rpt. 1929, pp. 28–30*).—In a study of the rural schools of the State the following data were obtained: Satisfaction with the present system—the elementary one-room school—was expressed by 98 per cent of the 274 rural district officers. Practically no desire seems to be present to consolidate the rural district with other rural districts or with a town district so as to include a high school department in the rural school system. While the farm population of the State comprises approximately 53 per cent of the total population, 51 per cent of the children attending high school were farm children. Of the 412 high schools in the State only 91 received State aid, having met the requirements for consolidated schools, and only 27 offered Smith-Hughes work in agriculture. Although 65 per cent of the men of the State engaged in gainful occupations were farmers and only 7.8 per cent were in commercial work, only about 7 per cent of the high schools offered vocational work in agriculture as compared with 38 per cent offering some commercial work. Of the graduates of Smith-Hughes courses in agriculture, 54 per cent were engaged in farming, 9.53 per cent in closely allied work, and 6.34 per cent were attending the State agricultural college. Nearness to home, trade centers, friends in attendance, and the reputation of the school were the chief factors influencing the choice of high schools by rural boys and girls.

Replies from farm homes in Brookings County to a questionnaire showed the percentages of the farmers who were patronizing one and two towns, respectively, for various services as follows: Selling 55 and 31, buying 39 and 47, social affairs 80 and 4.5, amusements 76 and 10, newspaper 78 and 10, doctor 87 and 1, and hospital 73 and 3.

The conclusions are reached that (1) South Dakota farmers are eager that their children, especially the girls, receive a secondary education, and (2) as yet farmers do not see fit to initiate and maintain their own high school system but simply patronize for the most part the independent village or town schools. Attention is called to the fact that this results in the farmers having no direct participation in the control and maintenance of the high schools, and their influence is not felt directly in determining the type of courses offered.

Certain cash expenditures of Ohio farm families, [G.] BRINTON (*Ohio Sta. Bul. 446 (1930), pp. 162–164*).—An analysis of detailed household expenditures of 70 families for 1927 showed the average cash income to be $2,099.40 and the average household expenditure $1,107.52, of which 20.5 per cent was for food, 16.3 for clothing, 12.7 for operating expenses, 43.2 for indications of comfort, and 7.3 per cent for furniture, furnishings, and equipment. The amounts spent for different items under each classification are also included.

Contacts in a rural community, H. J. BURT (*Missouri Sta. Research Bul. 125 (1929), pp. 75, figs. 13*).—This bulletin reports the results of a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of a Missouri trade-area rural community approximately 52 square miles in area, having a population of 1,297 people, and consisting of an incorporated village of 314 people, 6 school districts, and about 50 per cent of the area of each of 6 other school districts. The main body of data was collected by selected local persons who obtained information as to the date, length, and place of all group events during the months of November and December, 1927, and January, 1928, and the names of the persons in attendance at each event. Supplemental data regarding visiting and trading within the community and contacts outside the community were obtained through questionnaires replied to by 692 persons over 5 years of age. The methodology used has been described in the article by the author entitled Research Methods in Social Organization: A Case Study in Method, previously noted (E. S. R., 62, p. 580). A contact is defined as " the exposure of one person to group influence for one hour."

The average contacts of different kinds per person within the community (1,297 persons) and outside the community (689 persons) were, respectively, religious 4.6 and 4.9, social 42.9 and 13.2, recreational 3.1 and 11.5, and educational 71.3 and 12.8, total 121.9 and 42.4. The total number of contacts in the different areas varied from 33.5 to 210.4 for contacts within the community, and from 0 to 70.7 for those outside the community. Of 680 persons for whom information was available for contacts outside the community, the numbers having no contacts within and outside the community were, respectively, religious 364 and 372, social 155 and 353, recreational 561 and 349, and educational 439 and 513. The total average contacts within and outside the community for different locations and age groups were, country young people 362.1, country children 348.4, village young people 332.7, village children 307, village adults 92.3, and country adults 37.9.

Tables are given showing for the several areas in the community the contact events of different types and contacts of different kinds (total and average per person) within and outside the community, the contacts of different kinds in different age groups, and the contact-producing power of the area.

In an analysis of the production and consumption of contacts of the areas, the following possibly determining factors—population of the area, distance of the area from the village, proportion of young people (6 to 20 years of age) to older people, percentage of home ownership, average property tax of owned homes, distance traveled per contact, and population density—were applied in turn to each of the following four conditions: Per capita production of contacts for other areas, per capita consumption of contacts produced by the area and produced by other areas, the ratio of contacts consumed within the community to contacts consumed outside, and the interchange of contacts. No correlation was found between any of the factors and conditions. The per capita contact production of the area outside the village was only one-tenth as great as that of the village for the outside area.

Organizations produced 76.3 contacts and unorganized activities 46 contacts per capita for the community as a whole. Educational organizations produced over 93 per cent of the organized, and over 90 per cent of the unorganized contacts were social in nature. Contacts produced by organizations cost from 1 ct. to $1.23 each, the average costs for different types being religious 40 cts., social 25 cts., recreational 25 cts., and educational 6 cts. Of all trade contacts of the community, nearly one-third were outside the community. Slightly over one-half of the trade contacts of the areas outside the village took place in the village. No correlation was found between passability of roads and the number of contacts.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Vocational education in agriculture (*Internatl. Labor Off., Geneva, Studies and Rpts., Ser. K, No. 9 (1929), pp. VII+244*).—This report is based on answers to the questionnaire sent out in 1924 by the International Labor Office to all State members of the organization, the United States, and Russia; the texts of laws, annual reports of agricultural and education departments, special pamphlets, etc., annexed to the replies; and the reports communicated to the International Labor Office by the States accepting the 1921 recommendations of that office concerning the development of technical agricultural education.

Part 1 gives a general survey on an international basis and includes an account of the organization, character, and chief divisions of vocational agricultural education and of the methods and technic employed. Part 2 summarizes the leading facts as to the existing systems in each of the countries reporting, setting forth the legislation, and describing the general structure of vocational agricultural education, the agricultural lessons incorporated in the general educational system, the vocational agricultural schools and institutions, and the extension courses and other similar institutions.

The function of research in public-school home economics, L. T. Hopkins (*Jour. Home Econ., 22 (1930), No. 5, pp. 358–364*).—This paper discusses the needs of research in defining the general aims, purposes, and functions of home economics and the objectives at various instructional levels, and in determining what content should be taught, methods of teaching, the outcomes of home economics education, and the most effective methods of training home economics teachers.

Food purchasing for the home, R. D. Blinks and W. Moore (*Chicago: J. B. Lippincott Co., 1930, pp. XIV+434, pls. 3, figs. 49*).—This is a textbook for courses in home marketing and a guide for home makers in the selection and purchase of foods.

Principles of farm mechanics, M. A. and W. M. SHARP (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. XX+269, pl. 1, figs. 335*).—A textbook organized on a unit basis with lesson plans, questions for class discussion, and directions for carrying out the operations given for each unit.

Lantern slides and film strips of the United States Department of Agriculture (*U. S. Dept. Agr., Misc. Pub. 72 (1930), pp. 14*).—Included is a subject list of the lantern slides and film strip series of the Department available, together with information of how loans of the series may be had or purchases made.

Workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1929–1930, M. A. AGNEW (*U. S. Dept. Agr., Misc. Pub. 67 (1930), pp. IV+127*).—This is the usual annual list (E. S. R., 61, p. 290).

Extension Service Review (*U. S. Dept. Agr., Ext. Serv. Rev., 1 (1930), No. 1, pp. 16, figs. 5*).—The initial number of this new serial publication is discussed editorially on page 1.

FOODS—HUMAN NUTRITION

Domestic preservation of fruit and vegetables ([*Gt. Brit.*] *Min. Agr. and Fisheries Misc. Pub. 69 (1929), pp. 72,* [*pls. 8*], *figs.* [*6*]).—This English handbook on home canning and preserving is of particular interest on account of some rather unusual recipes, including gooseberry, apple, plum, marrow and apple, green tomato, ripe tomato, and date chutneys. The methods described for canning nonacid vegetables include intermittent sterilization, sterilization under pressure, and the use of lemon juice. In the last-named method the vegetables are packed in the jars and completely covered with a solution prepared by adding 2.5 oz. of salt and 5 fluid oz. of lemon juice to 1 gal. of previously boiled water. The jars are sealed and placed in a hot water bath, the water of which is kept boiling for 1.5 hours, after which the jars are removed, refilled if the solution does not completely cover the vegetables, and returned to the sterilizer for another 20 minutes.

The influence of heat upon water absorption of certain dried fruits, H. B. THOMPSON and G. C. BURK (*Jour. Home Econ., 21 (1929), No. 8, pp. 593–598*).—A study of the conditions best promoting absorption of water by dried fruits in preparation for cooking is reported for dried apples, apricots, figs, and prunes, with the conclusion that long soaking in cold water does not improve the cooking quality of the fruits, but that soaking for a short time in hot water promotes water absorption. In general, soaking for 2.5 hours in water heated to 80° C. resulted in maximum water absorption and shortened the time required for cooking. The tables are given for the various times of soaking and cooking of the different fruits.

A method of recording the posture of preschool children, M. E. SWEENY, H. KING, C. A. WILSON, and L. HEJINIAN (*Detroit: Merrill-Palmer School, 1929, pp.* [*6*]*+33, figs. 16*).—This contribution from the Merrill-Palmer School, Detroit, Mich., consists of a critical review of the literature on methods of testing and recording posture in children and a discussion, with many photographic illustrations, of the method finally developed by the authors. This consists essentially in photographing the child standing in a natural position under standardized conditions and printing the photographs with a superimposed scale for use in measurements. Each child is photographed from the front, side, and back, with clothing removed. Information about the condition of the feet is based upon this posture photograph, the foot imprint, the physical examination, and in some cases the X-ray photograph.

As at present developed, the photographic measurements are considered most useful in determining postural defects. The measurements which seem most significant are discussed in considerable detail.

Seasonal variations in growth of pre-school children in Ohio, H. McKay (*Ohio Sta. Bul. 446* (*1930*), *pp. 160, 161*).—Growth records obtained throughout 1928 for a group of 22 preschool children whose records had also been taken the previous year showed the same trends as noted in the progress report for 1927 (E. S. R., 61, p. 489). Of the 22 children in the present report, 17 made or exceeded the expected gains in weight and 17 made or exceeded the expected gains in height. The average monthly gains in weight were 0.57 lb. in the summer and 0.45 lb. in the winter season and in height 0.24 and 0.21 in., respectively. It is concluded that if the findings for the third year corroborate the results for the first two years, it may be considered as an indication that there is a seasonal variation in the rate of growth of preschool children.

Basal metabolism of young women, H. McKay (*Ohio Sta. Bul. 446* (*1930*), *pp. 157–159*).—This investigation, progress reports of which have been noted previously (E. S. R., 61, p. 492), has been completed, with a total of 238 observations on 91 subjects from 14 to 18 years of age, inclusive. The figures for the entire group show the same trend as those previously reported for the smaller group. The total average heat production was practically the same for all ages, approximately 1,350 calories per 24 hours. The heat production per kilogram of body weight decreased fairly regularly with age. Disregarding age, the calories per kilogram of body weight decreased with increasing weight. The calories per 24 hours increased regularly with increase in stature. The calories per square meter of body surface varied little with age, the average being 37.7 calories for the 14-year group and 34.8 for the 18-year group. Tabulated data for the average heat production of the entire group of 91, the 63 subjects of normal weight, 19 overweight, and 9 underweight, showed only slight differences between the averages for the normal and the entire group. The averages for the overweight group were high for total heat production and heat production per centimeter and low for heat production per kilogram of body weight, and the opposite was true for the underweight group. The closest agreement for all groups was in the figures for calories per square meter of body surface per hour.

"Figures of heat production of this group of girls, as well as figures gathered in a study of day by day variations in the basal metabolism of young women in 1926 and 1927, seem to show that there may be a slight seasonal variation in basal metabolism, with a trend towards slightly higher heat production in the spring months. Such a trend was noted by Benedict in a study made at Wellesley College [E. S. R., 60, p. 392]."

Protein assimilation influenced by lactation (*Wisconsin Sta. Bul. 410* (*1930*), *pp. 21, 22*).—In this continuation by H. T. Parsons and I. Stevenson of the investigation previously noted (E. S. R., 59, p. 892), it was found that in rats the act of suckling the young was followed by an increase in the concentration of urea in the blood of the mother regardless of the time elapsing since food had been eaten. There seemed to be no correlation between this increase in the urea content of the blood and the amount of milk nursed.

Experiments to check these observations were conducted on lactating cows, dogs, guinea pigs, and rabbits. With cows no increase in the urea content of the blood could be observed, but with rabbits and guinea pigs there was a slight increase. Cooked beef liver proved to be slightly superior to casein as a source of protein for lactation in rats. Egg albumin was very unsatisfactory, and no young were raised when raw egg albumin served as the sole source of protein for the mother. Somewhat better, but far from satisfactory, results were secured with cooked albumin.

Tryptophane and growth, II, III, C. P. BERG, W. C. ROSE, and C. S. MARVEL (*Jour. Biol. Chem., 85 (1929), No. 1, pp. 207–231, figs. 7*).—Continuing the investigation previously noted (E. S. R., 62, p. 191), two papers are presented.

II. *Growth upon a tryptophane-deficient basal diet supplemented with trytophane derivatives* (pp. 207–218).—This paper reports the study of the influence exerted by radicals introduced into the amino and carboxyl groups of tryptophane without altering the remainder of the molecule. Following the usual plan, four tryptophane derivatives, acetyl, benzoyl, and methylene tryptophane and tryptophane ethyl ester hydrochloride, were prepared and used in place of equimolecular amounts of the free amino acid. Of these the methylene tryptophane and benzoyl tryptophane were not utilized for growth, while the other two were utilized as satisfactorily as was free tryptophane. In vitro experiments indicated that the ethyl ester hydrochloride probably undergoes hydrolysis in the alimentary tract, but that this is not so readily accomplished in the case of acetyl tryptophane. The explanation for the utilization of this compound is deacetylation after the derivative has been absorbed from the intestine.

III. *3-Indolepropionic acid and 3-indolepyruvic acid as supplementing agents in diets deficient in tryptophane* (pp. 219–231).—In this study 3-indolepropionic acid and 3-indolepyruvic acid were used in place of tryptophane, these two compounds differing only in the substitution of oxygen in the latter for the two hydrogen atoms in the α-position. The former compound was not available for growth in place of tryptophane, but the latter proved to have a remarkable efficiency as a substitute for tryptophane, probably being directly transformed into it. The negative results with 3-indolepropionic acid confirmed previous reports of negative results in attempts to replace any of the essential amino acids by synthetic compounds of analogous structure in which the α-hydrogens are unsubstituted.

How does copper function in the animal body? (*Wisconsin Sta. Bul. 410 (1930), pp. 30, 31*).—Pure hemoglobin was prepared from horse blood and rat blood by C. A. Elvehjem and E. B. Hart and tested for copper. Although traces of copper were always found, it was concluded that the copper was not a part of the hemoglobin molecule. The reasons for this conclusion were (1) the more completely the hemoglobin was purified the smaller the trace of copper that remained, (2) if the copper present were considered as part of the molecule, the molecular weight of the hemoglobin would be 2,000,000 or 3,000,000, while 66,000 has been generally accepted as its molecular weight, and (3) the copper was found chiefly in the corpuscles.

Canned peas carry minerals needed in nutrition (*Wisconsin Sta. Bul. 410 (1930), pp. 20, 21*).—Analyses by W. H. Peterson of the calcium and phosphorus content of canning peas of the smooth and wrinkled varieties grown on five different types of soil in nine localities in the State showed no significant differences between the varieties, but an increase in mineral content with size, the very small peas being conspicuously low in calcium. Inoculation of the seed peas had no effect on the calcium content of the resulting crop, but appeared to increase slightly the percentage of phosphorus. The maximum, minimum, and average values obtained (on the fresh basis) were calcium 0.088, 0.018, and 0.039 per cent and phosphorus 0.186, 0.094, and 0.131 per cent, respectively.

Vitamin A and carotene, II–IV, T. MOORE (*Biochem. Jour., 23 (1929), No. 6, pp. 1267–1272, figs. 2*).—This continuation of the investigation noted previously (E. S. R., 62, p. 587) is reported in three parts, as follows:

II. *The vitamin A activity of red palm oil carotene* (pp. 1267–1269).—A sample of carotin, melting point 162° C., obtained from red palm oil proved capable of restoring slow growth in rats on a vitamin A-free diet when fed in amounts of 0.01 mg. daily. The crude unsaponifiable fraction of the oil from which the carotin was isolated was much less active, 0.2 mg. being required for even irregular growth. A similar difference was noted in the colorimetric tests of the two samples. Both yellow and blue Lovibond units were determined. Attention is called to inaccuracies in the colorimetric method if applied indiscriminately over wide ranges of concentration. The technic adopted by the author is described in detail.

III. *The absence of vitamin D from carotene* (p. 1270).—A sample of purified carotin, melting point 174°, obtained from carrots, when fed as the sole source of vitamin D to rats on the Steenbock rachitic diet 2965, proved incapable of preventing rickets in doses as high as 0.75 mg. daily, or 100 times the minimal dose of vitamin A.

It is stated in a footnote that tests conducted by A. L. Bacharach with similar samples showed no vitamin D activity at a dosage of 0.11 mg. by the fecal pH method, or of 0.045 mg. by the line test method.

IV. *The effect of various dietary modifications upon the vitamin A activity of carotene* (pp. 1270–1272).—A sample of purified carotin obtained from carrots showed vitamin A activity at a level of 0.01 mg. daily, even when a fat-free basal diet was used and when paraffin oil replaced peanut oil as the solvent.

Some liver oils yielding a strong colour reaction with antimony trichloride, S. and S. SCHMIDT-NIELSEN (*Biochem. Jour., 23 (1929), No. 6, pp. 1153–1157, figs. 2*).—In this preliminary report of a comparison of the colorimetric and biological tests for vitamin A as applied to various fish liver oils, it is noted that in the treatment of the livers of certain fish the colors produced in the oil extracted from the livers by melting were less intense than those of the oils subsequently extracted with ether. The liver oils of halibut, salmon, red perch, mackerel, and whale, which can be obtained only by extraction with solvents, all gave strong color reactions with antimony trichloride. It was necessary to dilute these oils in order to determine the color intensity. Since on dilution the colors did not prove to be proportional to the degree of dilution, readings were made at different dilutions and the color intensities plotted against the dilution. From the curves thus obtained the amount of the liver oil which would correspond to six Lovibond blue units was selected, and from this value was calculated the color intensity for 0.04 cc. of oil, all readings being made after exactly one minute.

In the biological tests several of the oils gave much better growth curves when highly diluted than in the original concentration, thus suggesting a poisonous effect of large doses of the oils. It was also observed that rats required a much greater amount of vitamin A at the period of puberty, about the age of three months, than at other times. A survey of growth curves for rats in vitamin A experiments reported in the literature showed similar breaks at about this same age. In the opinion of the authors biological tests for vitamin A should be continued until the rats are five months old, and in reporting results in growth curves the three months' point should be indicated.

Butter cookies prove valuable as vitamin carrier (*Wisconsin Sta. Bul. 410 (1930), pp. 22, 23, fig. 1*).—Butter cookies of the ice-box type have been found by H. T. Parsons and I. Stevenson to be effective as a source of vitamin A and are recommended as a supplementary source of this vitamin for children.

Guinea pigs fed on irradiated oats with and without the addition of vitamins A and C [trans. title], N. BEZSSONOFF (*Bul. Soc. Chim. Biol., 11 (1929), No. 9, pp. 1146–1163, figs. 3*).—This is a general discussion of the author's vitamin A studies, including attempts at concentrating the vitamin from the juices of carrots, tomatoes, and cabbage by precipitation with lead acetate and extraction with petroleum ether and benzine; quantitative determinations of vitamin A in food materials, using mice and guinea pigs; and a comparison of various color tests.

In the author's opinion guinea pigs are more satisfactory than mice or rats in testing for vitamin A on account of their extreme sensitiveness to lack of this vitamin. In a series of tests with young guinea pigs, the basal ration consisted of whole oats 96 and fresh bakers' yeast 4 per cent, with vitamin C furnished by 0.8 cc. of lemon juice per 100 gm. of guinea pig and vitamin D by exposure of the animals to sunlight. On this basal diet the controls succumbed in from 13 to 15 days. In another series nearly grown animals were used, and the basal diet consisted of crushed wheat for the first 60 days and then oats, half of the ration being irradiated to furnish vitamin D. Data are reported on vitamin A determinations with various concentrates prepared as noted above.

The symptoms of vitamin A deficiency in guinea pigs are described as the constant and regular appearance of respiratory difficulties, with evidence on autopsy of pulmonary congestion, and occasional drying of the mucous membranes of the eyes, with in some cases complete opacity of the cornea.

Color reactions with dimethyl sulfate and with monomolybdophosphotungstic acid were considered more specific for vitamin A than the antimony trichloride test.

The vitamin B content of vegetables, I–III, M. C. House, P. M. Nelson, and E. S. Haber (*Iowa Sta. Research Bul. 120 (1930), pp. 333–344, figs. 5*).—This investigation was conducted in three parts as follows:

I. *The distribution of vitamin B in the carrot* (pp. 336–338).—Determinations by the Sherman-Spohn method of the vitamin B (F and G) content of the core (xylem), flesh (cortex), and skin (periderm) of carrots of the Chantenay variety gave statistically significant differences in gains in weight of the experimental animals on the same dosage of the different parts of the carrots. The periderm contained more vitamin B than the cortex and this than the xylem. "From a nutritional standpoint, then, carrots should not be peeled or scraped unless such a procedure is absolutely necessary to make them palatable. For the nutrition worker, these data stress the importance of careful sampling in all quantitative determinations of the vitamin content of foods."

II. *The effect of sunlight on the vitamin B content of lettuce, kohlrabi, and tomatoes* (pp. 339–342).—Lettuce of the Grand Rapids variety, White Vienna Kohlrabi, and Bonny Best tomatoes were grown out of doors in a series of plantings so that samples of the same degree of maturity could be used during a period of 8 weeks. The following winter the same varieties were grown in the greenhouse under as uniform culture conditions as possible. The vitamin B tests showed no significant differences between the garden-grown and hothouse-grown vegetables, although it is considered that more data are necessary for positive proof.

The kohlrabi, which has not been tested for vitamin B previously, proved to be a relatively good source, 4 gm. daily sufficing for fairly satisfactory growth.

III. *The effect of storage on the vitamin B content of carrots* (pp. 342, 343).—As has been noted from another source (E. S. R., 61, p. 391), carrots showed no appreciable loss in vitamin B on storage in a storage cellar for a period of 5 months.

Studies in the physiology of vitamins.—VII, Hemoglobin, solids, sugar, and chloride changes in the blood of vitamin B deficient dogs, C. J. Stucky and W. B. Rose (*Amer. Jour. Physiol., 89 (1929), No. 1, pp. 1–17*).—In continuation of the investigation previously noted (E. S. R., 61, p. 193), two series of blood studies have been conducted on dogs during the progress of B-avitaminosis and during a realimentation period after administration of vitamin B (F and G). In the first series 8 dogs were used, 1 serving as a normal control. Two of the others had simple gastric fistulae. Evidence of diminished water consumption during the progress of the vitamin deficiency made it seem desirable to start a second series of experiments with rigid control of the water consumption. No fistula animals were used and the method of pairing was followed, each dog on the experimental diet being paired with a control receiving the same amount of water and food daily that was consumed by the corresponding animal in the vitamin B-deficient group plus a daily supply of vitamin B.

The blood sugar values of the 2 animals in each pair showed no significant variations, thus indicating that lack of vitamin B does not affect the regulation of blood sugar in the dog. The blood chlorides tended to decrease in the B-deficient and control animals, thus suggesting that the decreases were due to partial starvation rather than vitamin B deficiency. The animals in the advanced stage of deficiency showed an average increase in hemoglobin of 13.7 per cent and in the total solids of the blood of 5.7 per cent, followed by a marked reduction in concentration soon after the administration of vitamin B. The degree of anhydremia appeared to be related to loss in body weight. Only 1 animal (a control) failed to show some evidence of anhydremia, and this was the only animal which did not lose weight. The animals on the B-deficient diet showed a definite decrease in water consumption, but it could not be determined whether or not this was due solely to anorexia.

Studies in the nutrition of the white mouse.—V, The experimental production of rickets in mice, H. H. Beard and E. Pomerene (*Amer. Jour. Physiol., 89 (1929), No. 1, pp. 54–57*).—In this continuation of the series of studies noted previously (E. S. R., 55, p. 292), a further study of the behavior of mice on a rachitic diet has led to a reversal of the opinion expressed in the second paper of the series that mice do not develop rickets. Failure to observe rickets in the previous study is attributed to the rapidity with which rickets is produced and cured in the mouse. Both the Osborne, Mendel, and Park and the Steenbock-Black rachitic diets were used. The mice were placed on the diet at three weeks of age and rickets developed in some cases as early as seven days.

[Vitamin C content of canned spinach and Swiss chard] (*South Dakota Sta. Rpt. 1929, pp. 15, 16*).—In this progress report (E. S. R., 61, p. 92) it is noted that spinach grown in a college garden and canned the same day that it was picked proved to have as high a vitamin C content as commercially canned spinach and higher than spinach bought on the market and canned. The method of canning was the same as noted in the previous report—blanching 2 minutes and processing 70 minutes at 15 lbs. pressure.

Home-grown Swiss chard canned by the same method on the day of picking appeared to have a very low content of vitamin C.

Canned sauerkraut good source of anti-scorbutic vitamin (*Wisconsin Sta. Bul. 410 (1930), pp. 19, 20, fig. 1*).—Previous studies on the vitamin C content of fresh sauerkraut (E. S. R., 62, p. 588) have been extended by B. Clow, H. T. Parsons, and I. Stevenson to six brands of commercial canned sauerkraut.

A daily dose of 5 gm. of two of the brands resulted in good growth, with no symptoms of scurvy, while with three of the brands 7.5 gm. daily was required to produce the same effect and with the sixth no protection was secured with 7.5 gm. daily. Since the controls grew normally and showed no symptoms of scurvy on 2.5 gm. daily of fresh cabbage as the sole source of vitamin C, it was concluded that some of the better brands of canned sauerkraut contain about half as much vitamin C as fresh cabbage. No tests were conducted on any other products of the sauerkraut industry.

It is noted that sauerkraut is not a particularly potent source of vitamin A, since the outer leaves of the cabbage are ordinarily removed in the manufacture of the kraut.

A quantitative study of the question as to the storage of antiscorbutic vitamin in the body, R. E. Anderson (*Diss., Columbia Univ., New York, 1929, pp. 22, figs. 2*).—The general plan of this investigation was to feed young guinea pigs a basal vitamin C-free diet supplemented for 4 weeks, during the period of most rapid growth, with systematically graded portions of orange juice as a source of vitamin C, and then to discontinue the orange juice and continue the feeding of the basal diet alone until death occurred. From observations of scurvy scores, according to the method of Sherman, LaMer, and Campbell (E. S. R., 46, p. 865), growth curves, and general behavior of the animals, it was possible to determine when and to what extent scurvy occurred in the different groups and from this to judge the storage of vitamin C in the bodies of the experimental animals. Four groups of young guinea pigs, comprising from 22 to 26 animals each, were used, and the amounts of orange juice fed each group were 3, 6, 12, and 24 cc. per guinea pig per day, the smallest amount representing about twice the minimal protective dose.

From the results obtained, which were subjected to statistical analysis, it was concluded that guinea pigs are capable of storing slight but significant amounts of vitamin C. The evidence for this conclusion was based upon (1) a slightly higher average scurvy score for the group receiving the smallest amount of vitamin C than for those receiving the larger amounts, (2) an earlier loss in weight of the animals in this group, and (3) an increase in the average survival period with increasing dosage of vitamin C up to 12 cc., beyond which increasing dosage appeared to have no effect.

In discussing the significance of these results, the degree of storage of vitamin C as compared with vitamin A is likened to the relatively small degree of storage of carbohydrate in the form of glycogen in the human body as compared with that of fat.

The course and prognosis of the disease caused by overdosage of solutions of vitamin D [trans. title], T. v. BRAND and F. HOLTZ (*Hoppe-Seyler's Ztschr. Physiol. Chem., 185 (1929), No, 5–6, pp. 217–233, pl. 1, figs.* [6]).—Sesame oil containing 10 per cent of irradiated ergosterol was fed to adult rats in doses of 40,000 vitamin D units daily. Symptoms of hypervitaminosis D developed very rapidly during the first week and more slowly thereafter. The animals lost weight, the fur became rough and dry, symptoms suggestive of paralysis agitans were often observed, and motility was greatly impaired. Susceptibility to secondary diseases, particularly pneumonia, was greatly heightened. There was a gradual increase in calcium and acid-soluble phosphorus in the blood serum, but no change in the calcium-phosphorus ratio. Dogs fed daily doses of 400,000 vitamin D units for 8 days showed similar increases in serum calcium, with very slow return to normal.

Histological examination of various organs of rats on the high dosage of vitamin D revealed a progressive calcification in the kidneys suprarenals, stomach, lungs, heart, and aorta.

Attention is called to the fact that young rats can stand a much higher dosage of vitamin D than grown rats.

A quantitative study of the determination of the antineuritic vitamin (F or B_1), E. F. CHASE (*Diss., Columbia Univ., New York, 1928, pp. 43, figs. 4*).—In this attempt to develop satisfactory technic for the quantitative determination of vitamin F by the rat-growth method, a source of vitamin G free from vitamin F was first sought. Bakers' yeast was autoclaved at 15 lbs. pressure for varying lengths of time, with and without alkali treatment. The yeast was autoclaved in 400-gm. lots in large Pyrex baking dishes, and 15 per cent of the autoclaved yeast thus prepared replaced an equal quantity of starch in the basal vitamin B-free diet of Sherman and Spohn (E. S. R., 51, p. 368). Six-hour treatment in the presence of 0.1 M potassium hydroxide was selected as giving the best assurance of practically complete removal of vitamin F.

In order to determine the conditions under which the least increase in the supplement of vitamin F would give the most perceptible gains in weight, graded daily portions of ground whole wheat, from 0.1 to 1 gm., were fed as the sole source of vitamin F to carefully matched groups of young rats. The growth curves of the different groups showed a graduation from loss in weight almost equal to that in the controls, with deaths from severe polyneuritis, on the 0.1 gm. amount, to limited growth with protection from polyneuritis on amounts of 0.6 gm. and above. The conditions finally established as most satisfactory for determining vitamin F are stated as follows:

"Quantitative comparisons of vitamin F values may be made by limiting the quantity of the vitamin so that, when this amount is fed daily six days per week to rats previously depleted of their store of vitamin F, weighing approximately 65 gm. and receiving a basal ration adequate in all other respects, including an abundance of vitamin G, it will allow a gain of 24 gm. in eight weeks, or of 3 gm. per week, with no apparent symptoms of polyneuritis."

MISCELLANEOUS

Report of the Raymond Branch Experiment Station, 1929, H. F. Wallace and J. L. Cooley, jr. (*Mississippi Sta. Bul. 271 (1929), pp. 38, fig. 1*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the South Mississippi Branch Experiment Station, [1929], W. R. Perkins, W. S. Anderson, and W. W. Welborne (*Mississippi Sta. Bul. 274 (1929), pp. 34, figs. 3*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-eighth Annual Report of [Ohio Station], 1929, C. G. Williams et al. (*Ohio Sta. Bul. 446 (1930), pp. 216, figs. 31*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1929, and a report of the director summarizing the work of the station during the year. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Annual Report of [South Dakota Station, 1929], J. W. Wilson (*South Dakota Sta. Rpt. 1929, pp. [2]+32*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1929, and department reports on the work of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

New science for an old art: Annual report of the director, [Wisconsin Station, 1929], compiled by N. Clark (*Wisconsin Sta. Bul. 410 (1930), pp. 148, figs. 59*).—This contains the organization list, an account of the activities of the station, a list of the station publications of the year, and a financial statement as to the Federal funds for the year ended June 30, 1929. The experimental features not previously reported are for the most part abstracted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [February, 1930], edited by V. R. Gardner and A. J. Patch (*Michigan Sta. Quart. Bul., 12 (1930), No. 3, pp. 73–119, figs. 10*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Russian Clover Seed Is Questionable, by C. R. Megee (p. 81); Cottonseed Meal Does Not Constipate Dairy Cattle, by L. A. Moore (pp. 87–91), noted from another source (E. S. R., 62, p. 554); and Suggest Methods to Control Inland Sand Blows, by K. Dressel (pp. 98–101).

The Bimonthly Bulletin, Ohio Agricultural Experiment Station, [March–April, 1930] (*Ohio Sta. Bimo. Bul. 143 (1930), pp. 33–64, figs. 11*).—In addition to several articles abstracted elsewhere in this issue, a note by C. E. Thorne is included entitled Henry M. Wachter, 1852–1929 (p. 34). This deals with the work of the manager of the Montgomery County Test Farm from 1908 to his death on December 25, 1929.

NOTES

Arkansas University.—William G. Amstein, county horticulturist and assistant county agent at Atchison, Kans., has been appointed extension horticulturist beginning April 16, vice Claude Woolsey, resigned.

California University and Station.—Dr. Fred N. Briggs, assistant pathologist in the Office of Cereal Crops and Diseases, U. S. Department of Agriculture, with headquarters at Berkeley, has been appointed assistant professor of agronomy and assistant agronomist in the station. He will be engaged in the extensive cereal breeding program being conducted at Davis in cooperation with the Department.

Dr. Paul Wallace Gregory, professor of zoology at Baker University, has been appointed assistant professor of animal husbandry and assistant animal husbandman in the station, where he is to develop research in animal genetics.

Florida Station.—Local interests have donated to the State of Florida three tracts of land to be used by the new substation at Homestead. The largest of these, consisting of 40 acres, is located in what is known locally as the pine lands, and on this tract an office and laboratory building is being erected by Dade County. Experiments are to be carried on with subtropical fruit and economic trees, such as citrus, avocados, pulp trees, oil bearers, etc.

Another tract of 30 acres is located in the highlands and is typical tomato land, while a third tract of 30 acres is in the East Glades. The soils in all of these tracts are lime or marl in formation. An associate horticulturist is to be appointed in charge of the new substation in the near future.

Dr. L. O. Gratz, associate plant pathologist at the Hastings Potato Field Laboratory, has been transferred to and placed in charge of the Tobacco Substation at Quincy. Dr. C. M. Tucker, plant pathologist at the Porto Rico Federal Station, has been appointed associate plant pathologist to carry on the potato disease research at Hastings.

H. W. Winsor has been appointed assistant chemist vice H. L. Marshall, resigned to accept a position with the U. S. Department of Agriculture. Other appointments include George D. Ruehle, assistant plant pathologist in the Washington Station, as assistant plant pathologist in the Citrus Substation; John P. Camp as assistant agronomist; and L. W. Ziegler as assistant entomologist.

Illinois University and Station.—Dr. F. P. Sanmann, associate in dairy manufactures, has been appointed associate professor of dairy manufacturing in the Oklahoma College and Station.

Iowa College and Station.—Following the resignation of Dr. J. E. Brindley, head of the department of economics, history, and sociology since 1913, to allow more time for research in public finance and taxation, Dr. A. G. Black, professor of agricultural economics, has been designated chairman of the department of agricultural economics. Dr. I. E. Melhus, professor of botany has succeeded Dr. L. H. Pammel as head of the department of botany, the latter remaining as chief botanist in the station. E. M. Mervine, professor of agricultural engineering, has resigned to become associated with the U. S. Department of Agriculture in the investigation and development of sugar-beet machinery.

Massachusetts College and Station.—The resignations are noted of L. R. Grose, head of the college department of forestry; C. O. Gates, assistant professor of landscape gardening; F. P. Griffiths, instructor in horticultural manufactures; Dr. J. P. Jones, research professor or agronomy; and V. A. Tiedjens, assistant research professor of vegetable gardening, to accept a position with the New Jersey Stations. F. A. McLaughlin, assistant professor of botany, has succeeded O. W. Kelly, resigned as analyst in seed control.

Minnesota University and Station.—Dr. E. C. Stakman, professor of plant pathology and plant pathologist, has been granted leave of absence to aid in organizing biological research in connection with a 50,000-acre rubber plantation in Liberia, which is being established by an American tire company. Arthur F. Verrall, instructor in plant pathology and assistant plant pathologist and botanist, accompanied him on this trip and is expected to remain for a longer period to oversee the experimental work of the company until it is well under way.

Montana College and Station.—The fertilizer department of the Anaconda Copper Mining Company has given $5,000 to the station for the current year for a study of the value of commercial fertilizers, particularly phosphates. I. J. Nygard has been appointed in charge of this study.

Irving J. Jensen, superintendent of the Judith Basin Substation since 1927, died May 22 at the age of 33 years. He was a native of Utah, graduating from the Utah College in 1918, receiving the M. S. degree in 1924, and serving as assistant agriculturist in the college and station from 1918 to 1920, when he came to Montana as assistant professor of agronomy and assistant agronomist.

Clyde McKee, head of the department of agronomy and vice dean, and John A. Nelson, head of the dairy department, have been granted leave of absence for one year for study. In their absence A. H. Post, associate professor of agronomy and assistant agronomist, and Glenn C. Sands, instructor in dairy industry, will be acting heads of the respective departments.

Recent appointments include Austin G. Goth as assistant in agronomy, who will give one-fourth time to station work; P. L. Slagsvold, assistant professor of agricultural economics, vice E. J. Bell, jr., resigned, beginning July 1; and Frank T. Donaldson, assistant chemist in the station, vice Matthew Veldhuis, resigned effective August 1.

Nevada Station.—With the beginning of the current calendar year, the department of farm development initiated a new system of cooperative bookkeeping on private farms. The farmers keep their own accounts with the different farm enterprises in loose-leaf account books designed by this department and adaptable to any size or type of farm. The books are supervised by a route statistician who visits each farm once a month and makes copies of all transactions for use in the cost-of-production studies. The advantage of this method over the usual cost accounting system lies in the fact that each farmer has at the close of the year a complete record of his various enterprises.

A modification of the system is also being used by some of the Smith-Hughes teachers and by a few private farmers within the State. These records differ from the detailed cost of production records in that a diary of the daily labor is not kept. The cash and feeding records are, however, available for the use of the department and are expected to supply valuable supplementary information.

New Mexico Station.—A contract has been awarded for the erection of a combination agricultural-biological building to cost approximately $80,000 and to be completed by next September.

North Carolina Station.—Frank T. Meacham, assistant director in charge of the Piedmont Substation since its establishment, died May 17 at the age of 61 years. He was a member of the first graduating class of the college in 1893. A recent statement in *Extension Farm-News* recalls that he "has been prominently identified with the agricultural advancement of the State and with the work of the North Carolina Experiment Station throughout a long, useful life. He began the system of farmers' field days and picnics at the station farms, and one of his greatest joys was to explain the work of the Piedmont station to the great number of people who visited him each year."

North Dakota College and Station.—Dr. A. F. Schalk, head of the department of veterinary medicine and station veterinarian, has resigned to accept the chairmanship of the newly established department of preventive veterinary medicine in Ohio State University. Fritz Volkmar, veterinary technician, has resigned effective October 1 to continue advanced study. H. L. Bolley, botanist of the station, has been granted a year's leave of absence beginning June 1 for a study in South America of flax and other crops. Dr. Herbert C. Hanson, associate professor of botany and associate botanist in the Colorado College and Station, has been appointed head of the college department of botany and station botanist, effective July 1.

Harry E. Ratcliffe has been appointed research assistant professor in farm management. Harold Seielstad, assistant in farm management in the station, has been transferred to the extension marketing department.

Ohio State University and Station.—A laboratory for research in textiles is being fitted up by the station in one of the university buildings for work on a Purnell project.

Grace Graham Walker, professor of home economics, and Frederick G. Charles, assistant professor of horticulture, died April 16 and April 18, respectively. Both were graduates of the university in 1913.

John R. Fleming, assistant editor, has resigned to become a special agricultural writer for the U. S. Department of Agriculture.

Tennessee Station.—The department of entomology has just completed a spray laboratory at the station. The building is 18 by 30 ft. and will provide facilities for carrying on research with spraying, dusting, and insecticide work in general.

Plans are also being made for the erection of a greenhouse to be used as an insectary.

Virginia Truck Station.—The recent session of the legislature made provision for extending the research work on soils and chemistry and appropriated $30,000 for the purchase of additional land to be used in plat work. Harold T. Cook has been appointed plant pathologist succeeding F. P. McWhorter, resigned on March 10.

Canadian National Research Laboratory.—An architect's model of a four-story building to be erected at Ottawa to house the National Research Laboratory of Canada is illustrated in a recent issue of *Nature*. This building is to cost approximately $3,000,000 and is expected to be completed in 1931. It will contain 250,000 sq. ft. of floor space, including accommodations for a library of 300,000 volumes and a large assembly hall for the use of the various scientific societies of the Dominion.

Among the divisions whose work is to be developed is that of economic biology and agriculture, of which Dr. Robert Newton, professor of field crops and plant biochemistry at the University of Alberta, is acting head.

Reorganization of Philippine Bureau of Agriculture.—The work of this bureau, for the past 30 years charged with the regulation and promotion of agricultural industries in the Philippines, has been divided into two parts and assigned to bureaus of plant industry and animal industry. Dr. Manual Luz Roxas, head of the department of agricultural chemistry of the Philippine College of Agriculture, a 1911 graduate of this institution and a recipient in 1917 of the Ph. D. degree from the University of Wisconsin, has been appointed director of the Bureau of Plant Industry.

Gift for Animal Health Research in Australia.—The Council for Scientific and Industrial Research of Australia has been given £20,000 for the erection of a laboratory for the investigation of problems connected with animal health. The donor is F. D. McMaster, an extensive sheep breeder of New South Wales, and the building will be known as the F. D. McMaster Animal Health Laboratory. A site has been provided on the grounds of the University of Sydney. It is expected that special attention will be given to problems affecting the sheep industry.

Necrology.—Dr. W. A. Orton, scientific director and general manager of the Tropical Plant Research Foundation since 1924, died at Takoma Park, D. C., on January 7 at the age of 53 years. Dr. Orton was a native of Vermont, the recipient of the B. S. (1897), M. S. (1898), and D. Sc. (1915) degrees from the university, and from 1897 to 1899 instructor in botany in the university and assistant botanist in the station. He was widely known for his pathological studies in the U. S. Department of Agriculture from 1899 to 1924, being in charge of cotton, truck, and forage crop disease investigations and from 1912 to 1924 vice chairman of the Federal Horticultural Board. He was also for many years editor of *Phytopathology*, and in 1920 president of the American Phytopathological Society.

Dr. James Wilson Robertson, eminent for his services to Canadian agriculture and education, died March 19. Dr. Robertson was born in Scotland November 2, 1858, coming to Canada in 1875. From 1886 to 1890 he was professor of dairying in the Ontario Agricultural College and for a part of that period a nonresident lecturer in Cornell University. In 1890 he became dairy commissioner for the Dominion and agriculturist of its Central Experimental Farm at Ottawa, and in 1895 commissioner of agriculture and dairying. He was largely instrumental in the establishment of Macdonald College and served as its first president from 1905 to 1909.

Dr. Thorburn Brailsford Robertson, professor of physiology and biochemistry in the University of Adelaide, died January 27 at the age of 45 years.

American Association of Agricultural College Editors.—The eighteenth annual meeting of this association is to be held in the newly completed administration building of the U. S. Department of Agriculture, Washington, D. C., from August 26 to 28, 1930.

Miscellaneous.—Dr. Curtis F. Marbut, chief of the Soil Survey, U. S. Department of Agriculture, has been awarded the Cullum Geographical Medal, conferred by the American Geographical Society in recognition of services of special distinction in the field of exploration and geographic research. On this medal are inscribed the words, "For his geographical work on the soil, 'the foothold of all things.'"

Dr. C. L. Huskins, research geneticist and cytologist of the John Innes Horticultural Institution, has been appointed associate professor of botany at McGill University.

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EXPERIMENT STATION RECORD

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The American system of agricultural education and research is so intricate, and the agencies associated with it are so numerous and so diversified in their functions and relationships, that the appearance of publications explaining the various phases of the movement is unusually welcome. The authoritative historical monographs of the late Dr. A. C. True on the origin and development of agricultural extension work and on agricultural education in general have been exceedingly useful and helpful in this connection, and his final contribution on agricultural research, which is still awaiting publication, will in due season complete an invaluable series. Meanwhile, other volumes are being written which further illuminate the subject and provide in convenient form information which would otherwise be comparatively inaccessible and for the general reader not always easy of correct interpretation.

One of these volumes, entitled The Agricultural Extension System of the United States, has recently appeared under the authorship of Dr. C. B. Smith and Mr. M. C. Wilson. Both of these writers have been engaged in the promotion, supervision, and administration of extension work for more than 20 years, and they are therefore amply qualified to speak from a substantial background of experience. They point out that "extension work in agriculture and home economics in the United States is second in importance in rural development only to the establishment of agricultural colleges and experiment stations," enrolling over 5,700 Federal, State, and county employees, cooperating with approximately 250,000 volunteer local leaders and 1,500,000 farm and home demonstrators, at an annual expenditure of over $23,000,000, and influencing each year approximately 3,000,000 farmers and farm homes to change for the better some practice of the past. They aver also that the "extension forces are coming increasingly to see that more important than the changed practices is the changed man," and in this spirit they discuss in detail what they describe as "a new leaven at work in rural America," which is "stimulating to better endeavor in farming and home making, bringing rural people together in groups for social intercourse and study, solving community and neighborhood problems, fostering better relations and common endeavor between town and country, bringing recreation, debate, pageantry, the drama and art into the rural community, developing cooperation, and enriching the life and broadening the vision of rural men and women."

Their book is directly supplemental to Dr. True's historical account, dealing with the cooperative agricultural extension system less as it has been than as it is to-day. However, it considers not only the existing organization but many of the accomplishments. It is designed to be "informative and instructive to extension workers in agriculture and home economics now in the field, to students in schools and colleges preparing for extension work, and to that host of men and women throughout the world who desire to keep informed on significant matters affecting rural progress." There is abundant reason to surmise that all of these groups will find within its pages much that is of interest and appeal.

The book is imbued with a distinctly educational purpose, analogous, it may be inferred, to that set forth as the fundamental aim of the extension work itself. This work, it points out, is "essential that of teaching, of showing the farmer and his family and the rural community how to apply the practical results of the investigational work and studies of the Federal Department of Agriculture, the State agricultural colleges, and like institutions to the problems of the farm, the farm home, and the rural community. . . . The end sought is a more efficient and profitable agriculture, an adequate supply of food and clothing for the nation, a wholesome rural life, and an intelligent, alert, progressive rural people."

The bulk of the 400 pages of the book is naturally given over mainly to accounts of the various factors in extension work—the county and home demonstration agents, the club and local project leaders, the subject matter specialists, and the many other cogs in the administrative machinery—and to the well-known methods by which this work is being done. Space is found, however, for other things, and among these is a chapter on extension research. Here it is well brought out that "extension work can not reach its fullest development until a body of scientific data relating to the organization and conduct of the work has been built up for the information and guidance of those administratively responsible for its direction. Neither will extension workers be able to look upon their work as a profession in the absence of reliable data to guide them in the intelligent prosecution of their work. In other words, extension organization and teaching must acquire scientific background, just as the subject matter taught through extension must have a scientific foundation in the research work of the United States Department of Agriculture, the State experiment stations, and other like institutions."

The accomplishments in this field are briefly recounted since 1922, when recognition was given in the reorganization of the Office of Cooperative Extension Work to this phase of the extension field. Frank acknowledgment is made that the studies made to date are but a beginning, and that "progress has necessarily been slow because methods of study had to be developed as the studies were conducted, since it was impossible to make use of plans followed in other types of educational research." Yet it is believed that "out of experience and numerous consultations with extension leaders and recognized authorities in the research field have been developed methods of study which are proving reasonably satisfactory," a growing interest in the work on the part of administrative and supervisory officers is indicated, and a new field has been opened up for study by graduate students recruited from extension ranks who are working on thesis problems.

"The time would not seem far distant," it is concluded, "when the larger States, at least, will be systematically adding new data each year to our knowledge of the conduct of extension. If the Federal extension office can continue to coordinate these efforts along lines of extension research a large volume of reliable data regarding the many phases of extension teaching will soon be available to all extension workers."

The book closes appropriately with a chapter on the vital topic of training extension workers. It is shown that under normal conditions from 900 to 1,000 new men and women are required for service each year and that their adequate training is of cardinal importance. Practically all extension workers are now agreed, it is said, that "technical training should be supplemented by professional training suited to the extension job. Some directors even go so far as to rate professional training of equal importance with subject-matter training."

Considerable aid is now being afforded in these directions by the special undergraduate courses which are being offered in about half of the agricultural colleges, and the plan of giving apprentice training as assistants to county agents is also reported as in effect in some localities. Training is also becoming more available to extension workers who are employed permanently. "Extension administrators and supervisors as well as the field workers in extension have long felt the need for systematic postgraduate training for extension workers who have been on the job several years. A large number of States either have some arrangement or are perfecting a plan whereby extension workers may be granted leave of absence for purposes of study."

These expedients by no means afford a complete solution of the problem, and the authors believe that "with interest in advanced training for extension workers rapidly crystallizing into definite arrangements for granting leave of absence for short periods, there will soon be a demand for a few universities well scattered throughout the country to develop real graduate courses in extension methods, and make possible graduate research in the extension field. Literature is being developed rapidly which will provide a background for such courses. Many extension workers interested in obtaining an advanced degree desire to undertake a problem in their own field as well as to obtain supplemental training in technical agriculture or home economics."

Attention is called to two graduate courses which were offered by the University of Wisconsin and a third by Cornell University during the current summer. It is deemed probable that the leading universities "will soon be providing systematic graduate courses to meet the requirements of extension workers seeking professional improvement. The next logical step is the establishment of fellowships in extension research."

By way of summary, the authors conclude in part that "the near future will probably see a county agricultural agent and a home demonstration agent in practically every rural county in the United States, with at least one boys' and girls' club agent in three-fourths of the rural counties. In the Cotton Belt the present number of negro county agents will probably be doubled. In the richer and more populous counties there will be enough agents employed to do the job, no matter how large that job, since people have what they want and what they are willing to pay for. It would appear that the cooperative extension system at this writing is not over half complete. . . .

"The stabilizing feature of the whole extension system is the research work of the State experiment stations and the United States Department of Agriculture, the result demonstration, and the wide experience of farmers. Based on these foundations sound extension programs are built. . . .

"The demand is increasing for better trained men and women for extension positions. It is probable that extension workers of the future will be required to supplement the regular four years of undergraduate work with courses in economics, psychology, teacher training, social relations, and recreation. Graduate courses will be instituted at some of the leading universities where experienced extension workers may go for advanced training and research in the extension field. . . .

"The small beginning already made in extension research will need to be expanded in order that reliable data may be available regarding all phases of extension work, as a basis for wise administration, intelligent supervision, and efficient use of time. With both age and increased appropriations for extension, comes added responsibility for increased efficiency in the use of money and in the direction of extension effort."

The specific suggestion is advanced that there is a growing need for a national organization of extension workers following the general plan of the National Education Association. "Associated with the present total of over 5,700 paid extension workers in such an organization might well be the 250,000 volunteer local leaders who assist in the development and execution of local extension activities. The purpose of such an organization would be to promote professionalism, increased efficiency, and similar material interests of extension workers and local leaders. Membership might well carry with it subscription to a house organ devoted to those matters which would be of current interest and value to extension workers. A national organization of this character would give promise of becoming a great stimulus to extension teaching as a life profession."

With reference to the work as a whole, the view is taken that in spite of early misgivings and frequent predictions of disaster, "the great experiment in rural education has proved successful. The cooperative extension work of the agricultural colleges has come to stay. Farmers approve it and want it. Business men and commercial interests are satisfied that it serves a useful purpose in the welfare of the nation and are willing to support it."

"The expected bureaucratic domination on the part of the Federal Government," it is pointed out, "has failed to materialize. The partnership of agricultural colleges, United States Department of Agriculture, county governments, and farmers in financing the work and in developing and carrying out plans together, while theoretically beset with great difficulties, has been found in practice to work out satisfactorily to all concerned. There is nothing on the horizon to indicate that the system will not continue to function with increasing satisfaction. It has the confidence of the nation."

The closing paragraph is pervaded by a final note of optimism. "With the outlook for at least 10,000 technically-trained extension men and women within the next dozen years, working in rural districts with 3,000,000 or more farmers and their families each year, thinking through farm, home, and rural community problems, devising plans for their solution, putting on demonstrations to show the better way, and through field meetings, tours, and publicity spreading a knowledge of results, what a leaven have we for the improvement of rural life! Who shall say we are not at the beginning of a movement destined to make agriculture for the first time in the history of the world the envied occupation, the golden age for the man who lives by the plow and works with his hands."

Most of the information so effectively assembled in the book has been drawn from official and other reliable sources, and in collecting and digesting this material the authors have rendered a useful and much needed service. But as many of the passages which have been quoted indicate, they have produced much more than a compendium of facts. Of all educational ventures the extension enterprise is one of human relationships, and in this volume these relationships are revealed and considered with unusual sympathy and understanding. For this and other reasons the book should be not only an accurate and enlightening interpretation to the general public of the movement as it stands to-day, but an inspiration to every present and prospective worker within the field.

The acceptance by Dean H. L. Russell of the newly established position of executive manager of the Wisconsin Alumni Research Foundation is an event of more than local interest. For more than 20 years Dean Russell has been at the helm of the Wisconsin College of Agriculture and director of the Wisconsin Experiment Station. Under his constructive leadership this long period has been one of broad development and much prosperity for these institutions, and his relinquishment of their direction is obviously a tribute to the importance and the inherent opportunities of his new position.

The Wisconsin Alumni Research Foundation is a nonprofit sharing educational enterprise, organized in 1927 under authority granted by the university board of regents. Its primary purpose is to foster and develop to a commercial stage and promote the subsequent utilization of the discoveries and inventions of such members of the staff, alumni, and friends of the university as may desire to turn over to the foundation the patents which have been or may be secured on their inventions.

For some time it has been the practice of educational institutions to encourage and in many cases to require their staffs to take out patents for the benefit of the public of discoveries that have commercial possibilities. This is done mainly to prevent such discoveries from being exploited, and from this point of view has been fairly successful. Not infrequently, however, an unfortunate result has been the lack of any practical utilization of the idea because of the unwillingness of commercial concerns to undertake its development without more adequate protection from competition. This difficulty the foundation aims to overcome by a system of licenses on a royalty basis, retaining the principle of public benefit by using these royalties to promote the development of research in the university.

Thus far a number of patents have been acquired by the foundation, thereby relieving the scientific staff of considerable work along unfamiliar and more or less extraneous lines. In one case, dealing with a method of activating foods and drugs with ultra-violet rays as the source of vitamin D, the royalties accruing have been sufficient to finance a special series of university lectures in general physiology.

The administration of the foundation, which as its name implies is an alumni organization, is intrusted to a board whose membership is drawn from the alumni body. Office and laboratory space has been provided for its work in the university buildings, but its affairs are otherwise to be conducted without expense to the institution.

The activities of the foundation are rapidly expanding and are now reaching a stage necessitating their supervision by a full-time permanent executive. It is this position which, beginning June 1, 1930, Dean Russell is to fill, with the understanding that until his successor is appointed he will continue to carry a portion of his previous duties with the College of Agriculture and the station. From these, however, it is expected that he will be relieved in due season, and that thereafter he will be free to devote himself to this unique enterprise. His assumption of its leadership will intensify the general interest which is being shown in the undertaking.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The properties of arachin and conarachin and the proportionate occurrence of these proteins in the peanut, D. B. JONES and M. J. HORN (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 7*, *pp. 673–682*).—This is a contribution from the Protein and Nutrition Division, U. S. D. A. Bureau of Chemistry and Soils.

In addition to the confirmation in several respects of the earlier results of Johns and Jones (E. S. R., 37, p. 8), the authors of the present paper report determinations of the specific rotations of arachin and of conarachin, the values found having been $[\alpha]^{20}_{D}=-39.5°$ and $-42.7°$, respectively, together with tests of the action upon arachin in solution in 10 per cent aqueous sodium chloride of trichloracetic acid, of tungstic acid, and of tannic acid. "In the presence of peptone trichloracetic acid precipitated all of the arachin but none of the peptone; tannic acid precipitated 39.13, and tungstic acid 44.66 per cent of the peptone nitrogen in addition to the arachin when both the latter were present in 10 per cent sodium chloride solution."

Proteins of the prolamin and glutelin types were not found in the peanut meal examined.

Concerning the nature of the protein extracted from wheat flour by hot alcohol, M. J. BLISH and R. M. SANDSTEDT (*Cereal Chem.*, *6* (*1929*), *No. 6*, *pp. 494–503*).—"The work was designed thoroughly to test the possibility of a peptization of nongliadin material by the hot alcohol" commonly used for the estimation of the gliadin content of flour, and is here reported from the University of Nebraska.

Boiling 70 per cent alcohol was found not only to disperse or dissolve wheat flour gliadin but to exert also a very appreciable peptizing action upon the glutenin. It is therefore concluded that hot alcohol is not a reagent suitable for use in the quantitative estimation or isolation of wheat gliadin. Further, "the use of hot alcohol for isolating or purifying any of the cereal proteins is of doubtful validity, and is open to serious question. It appears likely that 'glutenin' is a derived rather than a naturally occurring protein substance."

The phosphorus of grains, J. E. GREAVES and C. T. HIRST (*Cereal Chem.*, *6* (*1929*), *No. 2*, *pp. 115–120*).—In wheat an average proportion of 6.3 per cent of the total phosphorus content was found to be in the inorganic form, under the conditions of the experiments here reported from the Utah Experiment Station; in oats, 9.8 per cent; and in barley, 9.6 per cent. Corn grown under conditions varying with respect to water supply and manuring treatment contained from 0.32 to 0.35 per cent of total phosphorus, of which from 12.2 to 16 per cent was in inorganic combination. "Apparently the addition of barnyard manure to soil increases the proportion of inorganic phosphorus in the corn kernel."

Manganese in cereals and cereal mill products, J. DAVIDSON (*Cereal Chem.*, *6* (*1929*), *No. 2*, *pp. 128–133*).—This contribution from the U. S. D. A. Bureau of Chemistry and Soils reports an examination for the manganese, total ash, and protein content in five varieties each of hard winter wheat, soft winter wheat, red spring wheat, white spring wheat, rye, corn, rice, oats, and barley.

"No correlation was found between the manganese and the ash content either in the varieties of one cereal or in different cereals. Neither was any correlation found between manganese and protein, except when the types of wheat are considered collectively. In that case the relation was inverse, the hard winter and red spring wheats being higher in protein and lower in manganese than the two types of soft wheat. The manganese content of Red Rustproof oats grown in Arlington was several times higher than that of oats of the other varieties studied. There was no distinct correlation between the manganese content and the protein content of the cereal products, with the exception of the milling products of wheat. The products having a low ash content also had a low manganese content, both being due to the low degree of extraction. The results indicate that there is no correlation between the manganese content and the diastatic properties of the cereals studied. Corn and uncoated rice, which are associated with nutritional deficiency diseases, were both low in manganese."

The march of acidity in stored flours, C. C. Fifield and C. H. Bailey (*Cereal Chem., 6 (1929), No. 6, pp. 530–540, figs. 3*).—Among the findings of these experiments from the University of Minnesota are those of an increase of acidity from about 0.1 to more than 0.15 per cent in the case of a spring wheat second clear flour freshly milled and stored about 40 days. Between the limits 25° and 35° C. the rate of increase in acidity rose with the temperature. The rate of increase was greater during the first three months than during later periods of storage. Durum first clear flour showed a somewhat similar behavior, but had an acidity of but 0.05 to 0.06 per cent (calculated as sulfuric acid) at the beginning of the experiment, increased in acidity more slowly, and reached 0.15 per cent acidity in somewhat less than 150 days at 25°. Patent flour still contained appreciably less than 0.15 per cent of acidity, calculated as sulfuric acid, after more than five months' storage.

Baking tests failed to show any unsoundness of the stored flours even after development in the clear flours of an acidity in excess of 0.15 per cent.

The effect of dry skimmilk upon the water absorption of doughs and the plasticity of flour suspensions, J. L. St. John and C. H. Bailey (*Cereal Chem., 6 (1929), No. 2, pp. 140–150*).—"Power required to operate a dough-mixing unit tends to decrease as the proportion of water present is increased. Dry skim milk increases the water-imbibing capacity of dough as indicated by the power input. It proved necessary to add about one unit of water by weight for each unit of dry skim milk to maintain the same degree of plasticity in the dough as measured with the wattmeter and motor-driven mechanical dough mixer."

Other physical properties of similar general indication were also brought out in these experiments from the University of Minnesota.

Recent progress in the chemical study of the vitamins, J. C. Drummond (*Jour. Soc. Chem. Indus., Trans., 49 (1930), No. 1, pp. 1T–10T*).—This is an extensive and critical review of recent attempts at isolating and determining the chemical nature of vitamins A, D, E, C, and B_1, with 86 references to the original literature. In the final discussion, attention is called to the superficial resemblance between the vitamins and hormones. The successes already achieved in the study of the chemistry of the hormones are thought to offer encouragement to further attempts to isolate and determine the nature of the vitamins.

The vitamin activity of carotin [trans. title], M. Javillier and L. Émerique (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 10, pp. 655–657*).—Attention is called to conflicting reports concerning the activity of carotin as a source of vitamin A. The earlier studies from the senior author's laboratory in which pure phytol was found to be inactive as a source of vitamin A (E. S. R., 53, p. 10) are recalled, with the observation that samples of phytol which still contained traces of carotin always showed some vitamin activity. A sample of spinach carotin preserved for 40 years in an atmosphere of hydrogen in a sealed tube in diffused light has recently been tested for vitamin A and found to be effective in a dosage of 0.01 mg. per 100-gm. weight of rat.

A study of the antimony trichloride color reaction for vitamin A, E. R. NORRIS and A. E. CHURCH (*Jour. Biol. Chem., 85 (1930), No. 2, pp. 477–489, figs. 2*).—Antimony trichloride tests, carried out according to the technic of Norris and Danielson (E. S. R., 62, p. 111) on the nonsaponifiable substances of cod-liver oil prepared by the methods of Takahashi and Kawakami (E. S. R., 50, p. 801) or Marcus (E. S. R., 60, p. 895), gave no red coloration and a blue color which in Lovibond blue units was a linear function of the percentage concentration of the material tested.

Traces of petroleum ether and ethylene dichloride such as might be left in preparing the extracts had no effect upon the intensity of the color produced. Saturated fatty acids and oils likewise had no effect, but oleic acid and unsaturated oils accelerated the rate of fading of the blue color. The presence of unsaturated compounds in cod-liver oil is thought to explain the rapid fading of the blue color during the test, and the fading to account for the deviation from a linear function of the observed blue color produced by varying amounts of cod-liver oil. As the amount of the interfering substances decreases a point is reached at which they no longer affect the readings. This is thought to explain the findings of Norris and Danielson that at sufficiently low color values the curve for cod-liver oils appears to be a linear function.

It is concluded that "quantitative comparison of the color values between different oils or between colorimetric and feeding experiments can only be made at a sufficiently low value so that the dilution curve approaches a linear function, or be made on the unsaponifiable portion."

A rapid method for the determination of organic nitrogen in liquids, R. B. SANDIN and N. M. STOVER (*Canad. Jour. Research, 2 (1930), No. 4, pp. 264–266, fig. 1*).—The principle of the method described is that of the liberation of the nitrogen of the substance under examination by fusion with alkali out of contact with air, absorption of the ammonia evolved in excess of strong boric acid solution, and titration of the collected ammonia with sulfuric acid, bromophenol blue being used as indicator.

The apparatus used consisted of a copper tube 43 by 3.5 cm., closed at one end and provided at the other with a 2-hole rubber stopper carrying (1) a small copper tube reaching to the closed end of the fusion tube and (2) a trap connected through an adapter to the absorption flask. Air was swept out of the system by natural gas of which the excess is indicated as having been carried from the absorption flask to the draft flue from a second short tube in the 2-hole stopper of the flask. Samples of from 5 to 20 cc. of the liquid to be analyzed were placed in the copper fusion tube, and 10 gm. of sodium hydroxide, ("or, better still, a mixture of 5 gm. of sodium hydroxide and 5 gm. of potassium hydroxide, which is close to the eutectic mixture of melting point 185° C.") added. The absorption flask was charged with 50 cc. of saturated boric acid solution and 100 cc. of water. The fusion tube was then heated over a distance of about 10 cm. from its closed end to a dull red heat for about 15 minutes. During the heating and for a further 5 minutes the gas was kept passing through the system. The titration was performed with 0.1 N sulfuric acid to an end point indicated by the disappearance of the purple color of bromophenol blue. Commercial concentrated hydrochloric acid was found best for cleaning out the copper fusion tube. The completion of the determination is said to require only about 30 minutes.

Results tabulated in comparison with those of the Kjeldahl method show uniformly a very close agreement.

With respect to the use of natural gas for the sweeping out of the system and the carrying over of the ammonia, it is noted that "coal gas or water gas should work as well, provided care is taken to remove oxygen, carbon dioxide, and ammonia."

A comparison of the methods of extracting phosphoric acid from phosphates and Thomas slag, I, II [trans. title], B. A. SKOPINTSEV (*Udobrenie i Urozhaĭ, 1929, Nos. 1, pp. 37–39; 2, pp. 110–112*).—The two papers here noted constitute together a critique of the aqua regia extraction method and an account of a substitute method considered better.

Experiments on the determination of phosphorus in phosphates and Thomas slag show that aqua regia extraction on Thomas slag gives low results. For the iron-citrate method of determining the total phosphoric anhydride a mixture of sulfuric and nitric acids was as efficient an extractant as was aqua regia. With the latter 30 minutes' boiling was sufficient, the boiling to a sirupy consistency being superfluous. The sulfuric acid-nitric acid extraction method was found more rational because filtering was easier and the washing of the magnesium ammonium phosphate was also facilitated. For Thomas slag the aqua regia method was not suitable. To obtain a white salt of magnesium pyrophosphate the magnesium ammonium phosphate needed to be moistened with ammonium nitrate before heating.

On the methods of determining fluorine in phosphates [trans. title], S. N. ROZANOV (*Udobrenie i Urozhaĭ, No. 3* (*1929*), *pp. 162–165*).—A series of experiments designed to simplify the Penfield method for the determination of fluorine is described. It was found that carbonates do not interfere with the determination, and it is therefore unnecessary to heat the material to drive off carbon dioxide. In the presence of powdered silica 10 per cent of fluorine volatilized when the materials containing the fluorine were heated with a Teclu burner. In the electric furnace at 1050° C. all of the fluorine volatilized.

In place of ignition the author used chromic acid or potassium dichromate as in the determination of humus in the soil. The chromic acid, 3–5 gm., was placed in the vessel after the sulfuric acid had been added. It was found that this modification eliminated the preliminary ignition without loss of any fluorine.

A rapid and simple carbide method for estimating moisture in flour, M. J. BLISH and B. D. HITES (*Cereal Chem., 7* (*1930*), *No. 2, pp. 99–107, figs. 2*).—It was the finding of the authors of this contribution from the University of Nebraska, that "total flour moisture may be estimated, with a degree of accuracy sufficient for most purposes, in five minutes, by means of a modified calcium carbide procedure herein described."

Essentially, the apparatus used consisted of a dry Erlenmeyer flask fitted with a 1-hole rubber stopper carrying a 2-way stopcock, connected through the cross-arm of a T-tube (which carries a stopcock on its inserted arm) to a mercury manometer, together with a spoon of which the stem is driven into the under surface of the rubber stopper of the flask, while its bowl is bent to take a horizontal position in the assembled apparatus.

The procedure consisted in placing a 1-gm. sample of the flour in the spoon and inserting the stopper in the flask, prepared for the determination by the addition in the bottom of the flask of 2 or 3 gm. of powdered calcium carbide, opening the system to the air momentarily to equalize the pressure, and then shaking the flour sample into the powdered carbide, after which shaking at 1-minute intervals was continued until the pressure indicated by the manometer became constant.

Manometer readings were calibrated in terms of the quantity of water reacting with the carbide by blank determinations in which weighed quantities of water took the place of the flour sample.

It was found that a very definite, constant part of the flour moisture failed to react with the carbide, so that the determination requires adding 0.0455 gm. to the weight of water actually indicated by the acetylene pressure as read. Thus corrected, the figures obtained agreed very well with those furnished by the oven method.

Sundry means of hastening the determination of protein of wheat, H. L. Wilkins (*Cereal Chem., 7 (1930), No. 2, pp. 168–188, figs. 9*).—The paper consists of two parts entitled, respectively, Apparatus and Present Procedure, and A Fast, Reliable Modification of the A. A. C. C. Method for the Determination of Protein.

Part 1 describes various apparatus from a grinding device for the preparation of samples to improvements in distilling and titrating equipment, adapted to the facilitation of the work of the routine flour nitrogen determination. Part 2 contains a description of the method for protein determination.

Relation of quantity of sodium sulfate to time of digestion in protein determination, C. G. Harrel and J. H. Lanning (*Cereal Chem., 6 (1929), No. 1, pp. 72–78, figs. 3*).—The authors found the quantity of sodium sulfate added in the digestion of flour samples for protein determination to be of extreme importance, the time required for complete digestion with a given heat source varying with variations in the ratio of sodium sulfate to sulfuric acid. It is considered, in effect, that low results can often be explained as due to the use of an insufficient quantity of sodium sulfate; and it is further stated as the indication of a large number of determinations that more sodium sulfate is required when copper is used than when the catalytic agent is mercury.

Hygroscopy in flour ash and a discussion of direct ash weighing, L. U. Liddel (*Cereal Chem., 6 (1929), No. 2, pp. 134–139, figs. 3*).—The author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils expresses the opinion that error is introduced in the determination of ash in flour by variations in the weights of the crucibles used, notes that direct weighing, if not too much affected by the hygroscopicity of the ash, would eliminate this type of error, and presents in the form of graphs and tables data considered to demonstrate the reliability of direct weighing.

"The hygroscopic tendencies of flour ash affect the results very little in the period of time required for weighing the ash."

The determination of ash by the direct weight method, E. O. Klopfstein (*Cereal Chem., 7 (1930), No. 2, pp. 189–191*).—Using 5-gm. samples of flour and a detailed temperature schedule in burning the sample, "the author has now used this method of weighing ash directly since 1925 and it is his opinion that if each individual will endeavor to adapt the process to his own equipment it will, by virtue of its simplicity, prove a boon to any cereal chemist."

The adaptability of the quinhydrone electrode to cereal work, L. V. Sore (*Cereal Chem., 7 (1930), No. 2, pp. 143–153, figs. 2*).—Having discussed at some length the comparative properties of the quinhydrone and hydrogen electrodes, the author presents the conclusion that for flour work the quinhydrone is distinctly the superior type of electrode. Bare gold wire is the most satisfactory inert electrode, whereas bare platinum wire is suitable for most solutions free from suspended matter. The water-soluble proteins of water extracts of flours were found to have no effect upon the H-ion concentration as determined by the quinhydrone electrode.

Some general devices for perfecting the observation of the phenomena of fluorescence [trans. title], J. RIPERT (*Ann. Falsif., 22 (1929), No. 249–250, pp. 459–463, pl. 1*).—The author describes a photometric comparator for the comparison of the fluorescences shown by a standard and an unknown sample under ultra-violet transmitted by a Wood's filter. The two colors are brought together in a comparison or divided field as in a colorimeter, and are viewed by means of a suitable single eyepiece. Provision is made also for the passage of the light emitted by the sample and standard through blue, green, yellow, or red monochromatic filters and diaphragms permitting estimations of comparative intensities in the case of each of the separately examined components of the fluorescence radiation.

Using pure and adulterated samples of cacao butter, the author was able to show marked and characteristic differences in the radiations emitted under ultra-violet light when 10 per cent of foreign fat was present in cacao fat.

The determination of methylene blue [trans. title], M. FRANCOIS and L. SEGUIN (*Ann. Falsif., 22 (1929), No. 251, pp. 547–550*).—Methylene blue was found to form an insoluble picrate containing 1 molecule each of the acid and of the dye. An attempt was made to apply this observation in the form of a titration method, since it had been noted that the precipitate settled out rapidly enough to permit observation of the color of the supernatant liquid. The virage was not definite enough, however, to make the titration both rapid and accurate; and a gravimetric method based upon the same principle was given trial.

The methylene blue picrate precipitated was found to be crystalline, to contain no water on crystallization, and to be so slightly soluble in water as to permit the use of the small quantity of wash water necessary to remove the excess of picric acid without loss of accuracy. The precipitate was weighed after drying in air or over sulfuric acid in a desiccator. Recovery was of the order of 99 per cent, according to figures shown. Detailed directions for the gravimetric determination are given.

METEOROLOGY

Meteorological observations, 1927–28 (*Guam Sta. Rpt. 1928, p. 31*).—A condensed summary of observations on temperature, precipitation, and wind at the Guam Station during each month of the year ended June 30, 1928, is given. The weather of the year was favorable to crop growth. The total rainfall (78 in.) was less than that of the previous year (84 in.), but was evenly distributed and there was no prolonged drought.

Meteorological observations, [March–April, 1930], C. I. GUNNESS and D. F. MURPHY (*Massachusetts Sta. Met. Ser. Buls. 495–496 (1930), pp. 4 each*).—Observations at Amherst, Mass., are summarized and briefly commented upon.

Meteorological observations, A. BISSERUP (*Virgin Islands Sta. Rpt. 1929, p. 19*).—Observations on temperature, rainfall, evaporation, and wind velocity are summarized for each month of the year ended June 30, 1929. The total rainfall for the year was 38.01 in., as compared with 46.91 in. for the previous year. The annual evaporation was 62.8 in. It is recorded that the island of St. Croix was visited September 12 and 13, 1928, by a hurricane of unusual intensity. "The anemometer and the rain gauge were both blown down, and records of wind velocity and rainfall could not therefore be obtained. It is estimated, however, that the wind had a velocity of 130 miles per hour. The absolute maximum temperature for the year was 94° F., recorded August 6, 1928, and the absolute minimum temperature, 56°, was recorded January 30, 1929."

Meteorological report for 1928, F. E. Hepner (*Wyoming Sta. Rpt. 1929, pp. 50–52*).—The usual summaries are given of observations on pressure, temperature, precipitation, wind, and sunshine at the University of Wyoming, Laramie. The mean pressure for the year was 22.96 in. The mean monthly temperature was 41.3° F., the highest 85° July 31, the lowest —14° January 1. The last killing frost in spring occurred June 13, the first in autumn September 10. The total annual precipitation was 11.21 in. The number of clear days was 131. "As a whole the year was nearly normal as to precipitation and temperature. However, during the growing season, April to August, inclusive, the rainfall was about 25 per cent in excess of normal."

Instructions to marine meteorological observers (*U. S. Dept. Agr., Weather Bur. Circ. M, 5. ed. (1929), pp. VIII+80, pls. 8, figs. 23*).—This edition of these instructions is substantially the same as that issued in 1925 and previously noted (E. S. R., 60, p. 617).

SOILS—FERTILIZERS

The major soil divisions of the United States, L. A. Wolfanger (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. XVIII+150, pls. 2*).—The book has the following contents: Major soil divisions and their geographic qualifications, the pedalfers, the pedocals, geographic relationships, summary and conclusions, bibliography, and index.

The chemical composition of colloidal material isolated from the horizons of various soil profiles, I. A. Denison (*Jour. Agr. Research* [*U. S.*], *40 (1930), No. 5, pp. 469–483*).—The investigation here reported from the U. S. D. A. Bureau of Chemistry and Soils was mainly concerned with the composition of quantitatively isolated colloidal material of seven soil profiles selected to represent a wide range of composition and profile characteristics.

In some of the profiles the colloidal matter proved fairly constant in composition, in others wider variations were found. The constituents most frequently showing variation were silica, alumina, iron, organic matter, and combined water. "Except in the case of profiles developed from glacial material the percentages of the bases showed little variation with depth and were low in all horizons. Silica and alumina varied regularly in all profiles in which the colloids were not practically constant in composition. These variations, however, were not always in the same direction.

"The molecular ratio of silica to alumina plus iron showed in the case of colloids from several profiles a regular decrease with depth, indicating that extent of weathering was not the chief factor tending to reduce this ratio. The relatively low silica-sesquioxide ratios were attributed to the presence of free hydrated alumina in the colloidal material of the lower horizons. Further evidence of the presence of free alumina was obtained by fractionating the colloid showing a low silica-sesquioxide ratio. The colloidal fractions were found to contain a higher proportion of alumina to silica and more combined water than the gross colloidal materials. The presence of free alumina in the colloid of the lower horizons was accounted for on the assumption that colloidal material existing on the surfaces of altering mineral particles contains free alumina. The relatively high percentages of alumina and combined water in disintegrated but apparently undecomposed parent rock and the low pH values of this material indicate that some of the minerals composing this material have undergone extensive alteration."

For a general review of previous work on the composition of soil colloids the author refers to the work of Robinson and Holmes (E. S. R., 52, p. 508).

[Soil Survey Reports, 1925 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1925, Nos. 19, pp. 31, fig. 1, map 1; 20, pp. 31, fig. 1, map 1*).—The two surveys here noted were made in Kossuth and Clayton counties, located, respectively, in north-central and northeastern Iowa. Both surveys were carried out with the cooperation of the Iowa Experiment Station.

No. 19. *Soil survey of Kossuth County, Iowa*, T. H. Benton et al.—Kossuth County contains 629,120 acres of lands generally level or undulating, with occasional low hills or ridges and some gently to strongly rolling tracts. Improved stream channels and an extensive system of tile drains provide improved drainage to practically all farms.

The soils of this county are here classified as 9 series, inclusive of 15 types, and 1.8 per cent of unclassified material. More than 90 per cent of the total soil area of Kossuth County is occupied by the three highly productive types Clarion loam, 40.1 per cent, Webster silty clay loam, 27.8 per cent, and Webster loam, 23.6 per cent.

No. 20. *Soil survey of Clayton County, Iowa*, T. H. Benton and A. L. Gray.—Clayton County has an area of 501,760 acres, of which all save a small tract in the southwestern corner of the county "has a surface configuration resulting from erosion of nearly horizontal rock strata of varying degrees of hardness."

A second topographic division, parts of two townships only, is a part of the Iowan drift plain. Except in this very small second division, drainage is good, discharging finally to the Mississippi River.

The principal soil types of Clayton County are Tama silt loam 33.3 per cent, "the most desirable farming soil in the county," Fayette silt loam 28.8 per cent, and Clinton silt loam 12.6 per cent of the total area surveyed. The unclassified areas listed aggregate 8.1 per cent, of which rough stony land comprises 6.7 per cent, while the total of classified soils was found to consist of 21 series represented by 31 types.

[Soil Survey Reports, 1926 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1926, Nos. 8, pp. 45, pls. 2, fig. 1, map 1; 9, pp. 35, fig. 1, map 1*).—The two surveys of which the reports are here noted were carried out with the cooperation of the Minnesota Department of Agriculture and the Georgia State College of Agriculture, respectively.

No. 8. *Reconnaissance soil survey of Lake of the Woods County, Minnesota*, M. Baldwin et al.—Lake of the Woods County lies in the northern end of Minnesota. The county possesses a land area of 840,320 acres generally level, and provided with an extensive system of drainage ditches supplementing the natural drainage system.

The larger part of the soil area was found to be occupied by peat, 63.8 per cent, of which more than half was in the form of a shallow phase. A total of 13 other types belonging to 12 series occupy small areas.

No. 9. *Soil survey of Wayne County, Georgia*, G. L. Fuller and S. O. Perkins.—Wayne County, southeastern Georgia, is a nearly flat tract of 411,520 acres.

Plummer fine sand, characterized by drainage conditions such that "water stands on the surface part of the time, and the water table is always close to the surface," is the most important soil area, 25.8 per cent of the county. Extensive tracts of unclassified swamp total 17 per cent of the area surveyed; and Leon fine sand, practically nonagricultural by reason of an underlying hardpan, follows with 10.6 per cent. Altogether, 10 series of 21 types are listed, as well as 3 per cent of meadow, unclassified.

Factors influencing runoff and soil erosion, A. B. Conner, R. E. Dickson, and D. Scoates (*Texas Sta. Bul. 411 (1930), pp. 50, figs. 24*).—"The soil on which this work was done [near Spur] is Miles clay loam, and the results are considered as directly applicable to parts of 44 counties and approximately 14,000,000 acres of land of the Miles and Abilene and related series and indirectly applicable to all of the subhumid portion of Texas."

A study of the number and amounts of rains indicated that 20 per cent of the total rainfall was ineffective because of its occurrence as small showers, and that a further 20 per cent was lost as run-off, "leaving approximately 60 per cent of the total rainfall to be absorbed by the soil."

Also, "measurements of the water lost from the 8 control plats for the 3-year period show that 60 per cent of the total water losses occurred during the months of July and August, and in August alone 33 per cent of the losses occurred." A definite relation of intensity of rainfall either to run-off or to erosion could not be determined on account of the interference of other variable factors.

Run-off losses were found not directly proportional to the steepness of the grade, very heavy losses occurring on areas of slight slope. Erosion was more directly related to steepness of grade, however. Slopes having a grade as low as 1 per cent were found in danger of rapid impoverishment by erosion.

Grass was effective in checking run-off; milo was more effective than cotton; and cotton was better than fallow.

"Results from field areas as to the effectiveness of obstructions in preventing run-off and in increasing crop yields were not consistent, but in general indicate that considerable amounts of water can be saved by the use of contoured rows, level closed terraces, and dikes, and that the crop yield is in proportion to the amount of water saved." The level terraces were consistently more effective in saving water than were those built with a slope of 3 in. in 100 ft., and yielded, further, 109 lbs. an acre more of seed cotton than did the terraces of 0.25 per cent grade.

Soil investigations (*Wyoming Sta. Rpt. 1929, pp. 10, 11*).—When plats of alkali soil were treated experimentally with 10 tons to the acre of Tschermigite, or natural ammonium alum, the physical condition of the soil was improved, rendering it much more friable and more readily permeable by leaching water.

Peat soil as a means of soil improvement on humus-poor sand soil [trans. title], E. Nyström (*Svenska Mosskulturför. Tidskr., 44 (1930), No. 2, pp. 85–117, figs. 2; Ger. abs., pp. 115–117*).—In a summer of normal rainfall, as well, also, as in a season of more than the usual precipitation, treatment of sand soil with additions of low-moor peat soil gave large increases in yield; and the soil moisture, of which the plants were in need, was, under either of these conditions, noticeably increased. In a dry season, however, the peat treatment gave only small increases in yield, a result attributed to an increase in water supply too small, in relation to that needed, to permit of very marked effects.

Fertilizer problems in tilling peat marshes in White Russia [trans. title], P. S. Savkin (*Udobrenie i Urozhai, No. 4 (1929), pp. 217–221*).—In the peat soils from the marshes in White Russia potash and phosphoric acid, primarily the former, are the minima in most cases. The type of peat, however, determines the fertilizers necessary for proper yields.

The peats from moss marshes were poor in calcium, and vegetation experiments proved that they respond to lime treatment. Peats from grass marshes were rich in calcium, and lime additions were injurious to crops. On the grass marsh peat, additions of from 60 to 75 kg. of P_2O_5 as superphosphate to the hectare slightly decreased the yields; 30 to 45 kg. of P_2O_5 was beneficial. The addition of potash fertilizers increased the yields by 50 per cent. The peat soils under investigation showed also a definite response to nitrogen, sodium nitrate giving the best results and urea and cyanamide the poorest. The increase in yield due to the nitrogen was so small, however, that its use was found not warranted. Chemical analyses of the inorganic constituents of three types of peat are given.

Fertilizer experiments in 1926–1928 on peasant farms in the region of the Volga-Kama [trans. title], S. KH. ASSANOVICH (*Udobrenie i Urozhaĭ, No. 6 (1929), pp. 349–355*).—Fertilizer experiments with potatoes on a podzol loam, sandy loam, forest loam, and chernozem showed that the mineral fertilizers were as effective as manure on the podzol. The N–K combination was more effective than the P–K. On the gray forest soils the manure was more effective than the complete mineral fertilizer. On the chernozem soils the effects were not constant, the fertilizers being more effective on the northern types than on the southern. Phosphorus was found to be the first limiting factor on the chernozem soils. Wood ashes were effective for potatoes on the podzols. Experiments were also conducted with flax on gray forest loam and on chernozem. The latter responded more to phosphorus and the former to nitrogen, with very little effect from potash.

Field experiments in 1928 by the Mitscherlich method [trans. title], S. S. GERKEN (*Udobrenie i Urozhaĭ, No. 5 (1929), pp. 275–280*).—A series of 139 experiments at 80 experiment stations on three types of soil, podzol, northern chernozem, and southern chernozem, were conducted in accordance with the Mitscherlich method. The results are summarized as follows:

(1) In all soil zones the fertilizers had a positive, but varying, effect. (2) The podzol zone responded best to the application of fertilizers, followed by the northern chernozem. (3) A complete fertilizer was most effective in all zones, followed by the nitrogen-phosphorus fertilizer, showing that potash was not so important. (4) In the southern chernozem zone phosphorus was the first limiting factor, while in the other zones it was nitrogen.

Determining the nitrogen reserve in the soil by the vegetation method of Mitscherlish [trans. title], A. I͡A. SAMOĬLOVA (*Udobrenie i Urozhaĭ, No. 6 (1929), pp. 355–358*).—Oats, flax, hemp, tomatoes, potatoes, and sugar beets were tested on a medium podzolized clay soil in pots to which fertilizers N–P and N–P–K were added. Nitrogen was added in the amounts of 0.5 gm., 1 gm., and 1.5 gm.; phosphorus 15 gm., and potassium 0.4 gm. The results were analyzed by the Mitscherlich formula, two methods being used. In one case the activity coefficient 0.122, as given by Mitscherlich, was used; in the other the coefficient was calculated from the experimental data obtained and with it the reserve of nitrogen was determined by the same formula. The formula as used was

$$\lg (A-y)=\lg (A-cx),$$

y being the yield obtained, A the maximum yield possible with the optimum amount of the factor studied (nitrogen in this case), x the amount of fertilizer added, and c the activity coefficient. In calculating the results by the first method two equations were necessary. One was made up from the data on the yield without the addition of any external factor, the other from the yield data with the added external factor. With three nitrogen increments three pairs of equations were made up for each plant. The working formula was

$$A=-\frac{Ny_1-y_0}{N-1} \quad \text{and} \quad b=\frac{\lg A-\lg(A-y_0)}{c},$$

where N is the numerical value of the log of cx. For the second method three equations were necessary to determine the three unknowns A, c, and b. The best way of making these up is in connection with the increased amounts of nitrogen, which increase in an arithmetic progression. The working equations for calculation by this method were as follows:

$$A=\frac{y_1^2-y_0y_2}{2y_1-(y_0+y_2)}, \quad c=\frac{\lg(A-y_0)-\lg(A-y_1)}{x_1-x_0}, \quad b=\frac{\lg A-\lg(A-y_0)}{c},$$

A comparison of these two methods showed that the second method gives more reliable results, but it requires more plants per pot and more pots for each treatment.

Experiments with nitrogenous fertilizers on pasture land [trans. title], H. Osvald (*Svenska Mosskulturför. Tidskr., 44 (1930), No. 2, pp. 67–84, figs. 2; Ger. abs., pp. 83, 84*).—The work described was carried out on a meadow overlying deep "white-moss," or sphagnum, peat. The land is described as having been under cultivation 13 years at the time of the beginning of the experiments in 1926; the most important grasses of the stand were meadow foxtail, bluegrass, and meadow fescue; and the pH value of the surface peat was 5.8 in 1927. The annual fertilization consisted of 150 kg. per hectare (133.5 lbs. per acre) of phosphate (superphosphate or Thomas slag) and 150 kg. of 40 per cent potassium salts. Nitrogen, 40 kg. per hectare, was given in ammonium sulfate, oiled calcium cyanamide, granulated calcium cyanamide, and calcium nitrate, the nitrogen being applied either entirely in the spring, entirely after the first pasturing, or one-half at each of these times.

The conclusion drawn from these trials, of which the results are given in detail, was that the spring application of nitrogen gives a result much better than that obtained from late or from divided applications, that ammonium sulfate was the most effective form in which to apply the nitrogen, and that the nitrogen treatment increased the meadow foxtail and bluegrass but decreased the meadow fescue and red fescue.

Calcium cyanamide as a nitrogen fertilizer [trans. title], E. I. Ratner (*Udobrenie i Urozhaĭ, No. 2 (1929), pp. 71–76*).—Experiments at the Dolgoprudnoe Experimental Fields in 1928 show that calcium cyanamide with superphosphate or with precipitated phosphate gave higher yields than did either nitrates or ammonium sulfate. Pot experiments with cyanamide kept 7 to 8 years, which contained 9.11 per cent of dicyandiamide nitrogen, with cyanamide kept 2 to 3 years, which contained about 3 per cent of dicyandiamide, and with fresh cyanamide showed that 7- to 8-year-old cyanamide gave only half the yield produced by the normal cyanamide. A test of the residual effects showed that the 7- to 8-year-old cyanamide was more efficient than the freshly prepared cyanamide.

In seeking better methods of handling cyanamide it was found that mixing with soil was about as good as with anything else. Prolonged contact with the soil in the mix interfered with the efficiency of the fertilizer. The use of cyanamide for top-dressing was found rather risky. The amount of moisture in the soil did not seem to affect the cyanamide, the soil texture having been found the critical factor. The sandy soils were found more apt to show injury than clay soils.

The mineralogical characteristics of the phosphates of Russian phosphate deposits in connection with their agronomic utilization [trans. title], M. P. Fiveg and S. N. Rozanov (*Udobrenie i Urozhaĭ, No. 4 (1929), pp. 201–211*).—Vegetation experiments showed that kurskite, an amorphous optically inactive phosphate deposit, was as effective as soluble phosphate both in sand and soil cultures, while staffelite, optically active and well crystallized, gave negative results.

To determine the solubility of the two varieties of phosphate three extractants were used, (1) 2 per cent of citric acid, (2) citrate buffer mixture, and (3) tartrate buffer mixture. The pH of the buffer mixtures was 4. Five-gm. samples of the phosphates were treated with 500 cc. of the solutions and shaken for two hours in a rotary shaking machine, then filtered and phosphorus determined by the Lorenz method. The results show that the kursite phosphates are more soluble, although the differences between the kursite and the staffelite were not so clear cut as in the vegetation experiments.

The southern border of the raw phosphate effects according to the latest data [trans. title], A. N. Lebedîantsev (*Udobrenie i Urozhaĭ, No. 1 (1929), pp. 26–30*).—The author presents data showing that raw phosphates are effective not only on the podzol type and degraded chernozem, but also on chernozem and even on the chestnut soils. The degree of effectiveness decreases as the phosphates are applied to the degraded chernozems, chernozems, and chestnut soils. Similar effects were observed for superphosphate in the respective zonal types of soil. Beneficial effects from raw phosphates were observed also on ameliorated alkali soils.

The influence of roasting the raw phosphates on the availability of phosphoric acid [trans. title], N. D. Smirnov (*Udobrenie i Urozhaĭ, No. 6 (1929), pp. 359–363*).—Two kinds of rock phosphates, one of low (13 to 26 per cent) and another of high (23 to 30 per cent) P_2O_5 content were used. Four portions with particles from 3–1 mm. were made up and treated as follows: (1) No heat, (2) 300° C., (3) 600°, and (4) 800°. After roasting, the phosphates were ground in a mill and mortar and divided into three fractions, 0.5–0.1, 0.1–0.05, and less than 0.05 mm. The various fractions were analyzed for citrate soluble P_2O_5 by the Popp method. It was found that the higher grade phosphate showed slight increases of citrate soluble P_2O_5 upon roasting. The highest total P_2O_5 content was found in the smallest fraction. Pot experiments with the roasted phosphates on podzol and degraded chernozem with oats showed in most cases no superiority of the roasted over the untreated phosphates other than a slight increase in the solubility and movement of P_2O_5.

The influence of peat on the utilization of phosphoric acid from phosphates [trans. title], Z. V. Logvinova (*Udobrenie i Urozhaĭ, No. 4 (1929), pp. 211–216*).—Experiments with raw phosphates, with and without peat, on podzol soils showed phosphate-peat mixtures to have a more prolonged effect on the yield of clover than had phosphate alone. Similar results were obtained with buckwheat in pot experiments. The yield with the phosphate-peat mixture was equal to that with the ideal Hellriegel culture medium.

Composting the peat with the phosphate had no influence on the availability of the phosphates; apparently the exchange of the hydrogen from the acid peat for the calcium from the phosphate takes place as soon as the two are mixed. Meadow peat, less highly unsaturated than peat moss, did not give as good results when mixed with phosphates. Preliminary composting of the meadow peat-phosphate mixture improved its ability to furnish phosphorus to plants.

The higher the unsaturation of the peat the greater was the quantity of the soluble phosphorus obtained.

The forms of phosphorus in the soil and the response of soils to phosphate fertilizers [trans. title], A. I. DUSHECHKIN (*Udobrenie i Urozhai, No. 4 (1929), pp. 195–201*).—Experiments at various experiment stations showed that chernozem responds to phosphate fertilization, degraded chernozem not so much, and the chernozem-like loams still less, while the gray forest loam soils do not respond at all to phosphate fertilizers. Still the highest total amount of phosphorus is found in the normal chernozem and the least in the gray forest soils. Apparently the form in which phosphorus is found affects its availability to plants.

Analyses were made on chernozem, degraded chernozem, and forest loam and sandy loam soils for organic and mineral phosphorus content, and it was found that in chernozem the organic form of phosphorus is higher than in the other soil types. The method used was as follows: 100-gm. portions of soil were leached 8 to 10 times with 0.05 N hydrochloric acid, using 1 liter each time. A separate sample, after the first leaching, was treated with 5 per cent ammonia and the organic matter extracted. A similar extraction with ammonia was done on the samples which had been extracted 8 to 10 times with hydrochloric acid. The organic fraction was filtered through a Chamberlain filter to remove the fine mineral particles, and the phosphorus found in the filtrate was considered organic phosphorus, despite the recognized possibility that the filter might have retained some of the phosphorus. The ammonia extract before or after the hydrochloric acid extraction gave the same quantities of phosphorus, indicating that the hydrochloric acid extract does not contain the organic portion of the phosphorus.

It was found that the soils which did not respond to phosphorus fertilization responded to nitrogen treatment.

The experimental results with lime in the Leningrad region [trans. title], A. P. SMIRNOV (*Udobrenie i Urozhai, No. 5 (1929), pp. 281–286*).—It was shown that even though the region is in the podzol zone, which as a rule responds to lime, there are certain areas where lime is not beneficial but even harmful. This was found to be true on loam soils with limestone as the parent material and on certain peat soils. In general, however, lime is one of the principal limiting factors in plant growth, as shown by a series of experiments with and without fertilizer on limed soils.

The influence of lime in vegetable growing, A. W. BLAIR and A. L. PRINCE (*New Jersey Stas. Bul. 498 (1930), pp. 16, figs. 5*).—Soil fertility plats, of which some had received no lime during 20 years whereas others had been limed regularly at 5-year intervals, were used in a study of the growth of a variety of vegetable crops.

"In every case for the 3 years the yields were much increased where lime was used. Beets and carrots were a failure on the unlimed plat. The failure in this case was due in part to the fact that the acid soil had a very depressing effect on germination.

"For the type of soil and the crops under consideration, a soil reaction represented by medium acidity (a pH slightly above 6) seems to be preferable to one that is more acid than medium (below pH 6). Reactions of pH 7, or even slightly higher, appear to have no detrimental effect."

The important indirect effect of lime in encouraging the growth of soil-improving crops is also noted; and attention is drawn to the fact that "strongly acid soils may contain soluble aluminum compounds which are toxic to certain crop plants. Lime possesses the property of putting these compounds out of action. Heavy applications of superphosphate will do the same, but lime is more economical."

In the case at least of moderate applications, there was found to be little choice as between calcic and magnesian limestones.

Testing portable outfits for determining the lime requirement of soils [trans. title], N. REMEZOV (*Udobrenie i Urozhai, No. 1* (*1929*), *pp. 40, 41*).—The author describes two forms of portable apparatus for determining the lime requirement of soil, (1) the Wherry and (2) an outfit with a universal indicator. The Wherry outfit is not recommended because the extraction is made with water instead of with a neutral salt which gives the exchange acidity. The apparatus does not offer the possibility of taking a definite amount of soil and measuring out a definite amount of water, and this introduces an error. The second outfit has markings on the test tubes indicating approximately the ratio of soil to water. The wide range of the indicator and its solubility in water is another advantage.

The effect of sulfur on yield of certain crops, E. B. REYNOLDS (*Texas Sta. Bul. 408* (*1930*), *pp. 24, fig. 1*).—Report is made of experiments conducted at several of the substations to determine the effect on cotton, corn, oats, and cowpeas, in various combinations, of sulfur applications ranging from 50 to 10,000 lbs. to the acre.

"The use of sulfur made no significant or profitable increases in the yield of cotton, corn, or oats on the Bell clay, which is a dark calcareous soil, at Temple. The applications of sulfur ranging from 2,000 to 4,000 lbs. per acre, however, caused a slight reduction in the yield of corn. None of the treatments made the soil acid. Apparently sulfur had little or no effect on the development of root rot of cotton. The yield of cotton, corn, or cowpeas was not appreciably affected by applications of sulfur on the Lake Charles clay, a dark-colored prairie soil, at Angleton in the Gulf Coastal Plains. Sulfur applied at the rates of 100 and 200 lbs. per acre had no significant effect on the yield of cotton and cowpeas on Lufkin fine sandy loam soil at College Station. Similar results were obtained with these crops on the dark-colored Goliad fine sandy clay loam at Beeville. Sulfur did not have much effect on the yield of cowpea seed on Kirvin fine sandy loam at Troup, but the use of 500 lbs. per acre caused a slight reduction in the yield of hay. On the Nacogdoches fine sandy loam soil at Nacogdoches, apparently sulfur had little effect on the yield of cowpeas.

"The results obtained at these six different places in Texas indicate that sulfur would not increase the yield of crops in general and consequently its use as a fertilizer would not be profitable."

Minerals of Wyoming as soil correctives (*Wyoming Sta. Rpt. 1929, pp. 20, 21*).—Several minerals of the State were examined in a search for local alkali amendments and nitrogen sources. A jarosite from a deposit near Wamsutter was found to contain "considerable nitrogen in the form of ammonium salts" while other samples contained potassium or sodium as the principal basic element. "A number of samples of Tschermigite (ammonium alum) were analyzed for nitrate nitrogen, but they were not found to be very rich."

Inspection of commercial fertilizers for the season of 1929, H. D. HASKINS, H. R. DEROSE, M. W. GOODWIN, and J. W. KUZMESKI (*Massachusetts Sta. Control Ser. Bul. 51* (*1929*), *pp. 61*).—In addition to the usual report of analyses and guaranties, this bulletin contains a condensed record of pot experiments to determine the nitrogen availability of processed low-grade materials, activated sludge, and other organic fertilizers.

Each pot was charged with 38 lbs. of a soil mixture consisting of 1 part of loam soil from a nitrogen-deficient soil plat and 3 parts of sifted sand. Mixed into the entire quantity of soil in each pot was the following fertilizer mixture: Finely ground limestone 14 gm., potassium chloride and potassium magnesium sulfate 5 gm. each, high-grade potassium sulfate 2.5 gm., 16 per cent superphosphate and basic slag phosphate 18 gm. each, and of the nitrogenous material sufficient to supply 0.42 gm. The dry matter yield for each pot, the nitrogen recovery, the average relative nitrogen availability on the basis of dried blood rated as 80, and the nitrogen activity as indicated by the chemical methods are given for a considerable number of commercial organic sources of nitrogen, including dark dried blood, mowrah meal, horn and hoof meal, process tankage, garbage tankage, Milorganite, rape seed meal, Peruvian guano, and uric acid.

Manganese tests showed that the soil used did not require additions of this element as indicated either by dry matter yields or by nitrogen recoveries.

Inspection of agricultural lime products, H. D. Haskins and H. R. DeRose (*Massachusetts Sta. Control Ser. Bul. 52 (1929), pp. 8*).—This is the eighteenth report on the inspection of agricultural lime products in Massachusetts, including analyses. It gives the composition of the various products which have been sold, supplemented by comparative costs of units of effective oxides present. The function of lime as a soil amendment is briefly discussed, and tabulated data give suggestions as to safe applications based upon known soil reactions.

AGRICULTURAL BOTANY

Respiration of the soy bean, A. L. Hafenrichter (*Bot. Gaz., 85 (1928), No. 3, pp. 271–298, figs. 11*).—A comparative study of two varieties of soybeans, so selected that the seeds varied in composition only quantitatively, is said to have shown that the rate of respiration, at all temperatures, varies greatly, though without periodicity; that a great difference exists between the two varieties as regards the intensity and the fluctuation of the rate of respiration; and that, with the exception of the Manchu variety at 15° C., the maximum rate of respiration occurs early in the development of the seedlings.

Temperature influences greatly the degree and relative rate of variation in respiration, but not equally for each developmental stage nor for each variety. The varietal differences found were as great as the specific differences reported. The results of this investigation did not support the statement that differences in respiration in different plants can be explained on the basis of quantitative differences in the reserve food materials. Evidence presented upholds the theory that plants show an election of organic nutrients and the view that this election is reflected in respiration.

It is claimed to have been established in this work for the first time that soybeans grown in darkness show marked increase in respiration rate preceding complete exhaustion. No direct relation was found between respiration and growth. Accumulation of amino acids in soybean seedlings grown in darkness is incidental, not necessary to respiration. Amino acids were not found to stimulate respiration.

Evidence is presented indicating that the changes in the reserve food materials in developing seedlings are not progressive and gradual.

Anatomical study of plants grown under glasses transmitting light of various ranges of wave lengths, N. E. Pfeiffer (*Bot. Gaz., 85 (1928), No. 4, pp. 427–436, pls. 4, fig. 1*).—At the Boyce Thompson Institute for Plant Research in the summer of 1927, plants were grown for physiological experimentation in the houses which were described by Popp (E. S. R., 58, p. 124). Some of the plants, including *Mirabilis jalapa*, *Brassica rapa*, *Helianthus cucumerifolius*, and *Glycine soja biloxi*, were available for anatomical study, which was carried out and is presented with results in descriptive and tabular form. Summary tabulation is given also, bringing into one view the developments attained, under different wave lengths, by stem, leaf, and root separately. Usually the outdoor plants take first place, full-spectrum plants second, and visible-spectrum plants third. In some of the houses, both quality and intensity may be effective in bringing about the changes observed.

Effect of darkness and of light on the organic acids in the plant [trans. title], I. TOLMACHOV and K. PAVLOVS'KIĬ (*Zap. Kiïv. Silsk. Gosp. Inst.* (*Mem. Agr. Inst. Kiev*), *2* (*1927*), *pp. 11–21; Eng. abs., p. 21*).—Experimentation with plants, including *Helianthus tuberosus*, *H. annuus*, *Nicotiana rustica*, *Solanum tuberosum*, *Polygonum sachalinense*, *Beta vulgaris saccharifera*, *Syringa vulgaris*, and *Lupinus angustifolius*, is tabulated, with brief discussion. It is stated that if the plants before the beginning of experimentation in assimilation are kept in darkness, supposedly favoring the accumulation of organic acids, the heat of the burning of the leaves is then greater (normally high) after the leaves have been insolated. If the plants before the experimentation are kept in light, supposedly losing organic acids, the heat of combustion of the leaves is decreased to a rather low figure.

In a medium lacking carbon dioxide the heat of the burning of the leaves is greater after insolation if the plants before the experimentation have been in darkness.

The organic acids are supposed to add to the energy supply accumulated by the plant during the take-up of carbon dioxide.

Physical and chemical characteristics of expressed citrus leaf sap and their significance, A. R. C. HAAS and F. F. HALMA (*Bot. Gaz.*, *85* (*1928*), *No. 4*, *pp. 457–461*).—It is claimed that fundamental differences exist in the freezing point lowering as well as in the ash, calcium, and magnesium content of the leaf sap of Eureka lemon as compared with that of Valencia and Washington Navel orange. Sap of normal mature lemon leaves is less active osmotically and contains less ash and calcium, but more magnesium, than sap of orange leaves. A partial explanation of the differences between lemon and orange trees in sensitiveness to low temperatures is thus thought to be available.

Stimulating effect of amino acids on sugar metabolism of plant and animal cells, W. E. BURGE, G. C. WICKWIRE, A. M. ESTES, and M. WILLIAMS (*Bot. Gaz.*, *85* (*1928*), *No. 3*, *pp. 344–347*, *fig. 1*).—The optically active amino acids do, and the optically inactive ones do not, stimulate sugar metabolism in Spirogyra and in Paramecium. In agreement with the more intense metabolism which is general in animals, Paramecium uses sugar much more rapidly than does Spirogyra. As in case of higher animals and man, both organisms use dextrose and levulose much more rapidly than galactose, and with both insulin increases the sugar utilization rate.

Water-solubility of dry matter in relation to calcium nutrition of normal orange and lemon leaves, A. R. C. HAAS (*Bot. Gaz.*, *85* (*1928*), *No. 3*, *pp. 334–340*).—Citing results of studies by Kelley and Cummins (E. S. R., 44, p. 544), later work by Reed and Haas (E. S. R., 52, p. 27), and still later work by Haas and Reed (E. S. R., 60, p. 426) bearing upon the present work as here reported, the author states that the ash of normal citrus leaves of like age showed practically no varietal difference in composition. When the dry matter of these leaves is water extracted, the ash and calcium of the soluble part of the mature normal Washington Navel and Valencia orange leaves are more abundant than are those of the Eureka lemon.

The fresh-weight water percentage content of such leaves changes but little before their attainment of full size and the approach of maturity. Water-soluble magnesium is usually least when the leaves become fully grown but are still thin. The total of water-soluble sodium decreases with the age of the leaves. Over 90 per cent of the potassium in the dry matter of the leaves is water soluble. The water-soluble phosphorus decreases with aging.

"The relationship between the calcium nutrition of these citrus varieties and certain physiological characteristics is discussed to show the bearing the present paper has on the future direction of the investigation of citrus nutrition."

The action of sodium chloride in irrigation water on some cultivated plants [trans. title] N. Passerini and P. Galli (*Bol. R. Ist. Super. Agr. Pisa, 3 (1927), pp. 151–236, pls. 3; abs. in Coltivatore, 74 (1928), No. 8, pp. 232–234*).—The effects of sodium chloride dissolved in irrigation water are set forth for different plants, all of which showed high tolerance.

Selection of wheat seed by testing in salt solutions [trans. title], I. Bolsunov (Bolsunof) (*Zap. Kiïv. Silsk. Gosp. Inst.* (*Mem. Agr. Inst. Kiev*), *2 (1927), pp. 33–41; Fr. abs., pp. 40, 41*).—During investigations at Kiev in 1924 and 1925, studies were carried out with a new method of selection of wheat seed, employing the device of causing germination under a certain osmotic pressure secured by the use of solutions of salt or of sugar in concentrations equivalent to from 10 to 15 atmospheres. It is thought possible by this method to select plants characterized by high osmotic pressures in their cells and thus to augment resistance to drought effects, as also to heightened salinity in the soil. It is stated that the plants secured in this way gave, after being planted, crops from 20 to 45 per cent greater than the controls.

A study regarding the heredity of the index of resistance to drought is said to have shown it to be transmitted as a constant. The selected plants have also surpassed in yield the control plants under humid conditions. The seeds of the wheat strains so bred show heightened energy of germination, maintaining high resistance in a solution of ordinary salt of strength 0.5 to 1 per cent.

GENETICS

Experimental studies on mutations in fungi [trans. title], F. Chodat (*Bul. Soc. Bot. Genève, 2. ser., 18 (1926), No. 1, pp. 41–144, figs. 20*).—Forms of mutations were studied in *Aspergillus ochraceus* and *Phoma alternariacearum*.

Physiogenetic observations on maize [trans. title], A. Piròvano (*Ann. Bot.* [*Rome*], *17 (1928), No. 5, pp. 298–307, figs. 4*).—The author, some of whose previous activities in this connection, and methods, have been noted (E. S. R., 52, p. 29; 53, p. 329), has recently carried on some tentative experimentation with maize. A brief account of this experimentation is given, with some of the results of the influence of electricity as affecting normality in growth.

Heritable characters in maize.—XXXIII, Slit leaf blade, G. W. Beadle (*Jour. Heredity, 21 (1930), No. 1, pp. 45–48, figs. 3*).—The thirty-third of this series (E. S. R., 61, p. 122) describes a variation called slit blade (*sb*) which appeared in an Argentine flint corn at Cornell University. Behaving as a simple Mendelian recessive, slit blade is characterized by a decrease in size and ultimate disappearance of the plastids in certain longitudinal regions between the main vascular bundles of the leaf. Nuclear disintegration follows, and the tissues made up of the dead cells are often mechanically torn. It appeared that the *sb* factor lies in the *Y–Pl* chromosome, some distance to the left of *Y*, and that the order of the factors is *sb–Y–Pl*.

Heritable characters of maize.—XXXIV, Rootless, M. T. Jenkins (*Jour. Heredity, 21 (1930), No. 2, pp. 78–80, fig. 1*).—Rootless corn plants, first observed in 1926 at the Iowa Experiment Station in cooperative studies with the U. S. Department of Agriculture, were characterized by very limited root systems.

They had the same number of seminal roots as normal plants, but usually only a few crown roots developed, and these were at the lower end of the crown. Rootless (*rt*) was found to be inherited as a simple Mendelian recessive to normal.

Electrogenetic hybrids of maize [trans. title], A. Piròvano (*Ann. Bot. [Rome], 17 (1928), No. 5, pp. 347–356, pls. 2*).—Particulars and tabulations are given regarding Golden Bantam pollinated by Black Beauty.

Recent developments in electrically-induced hybrids among cucurbits [trans. title], A. Piròvano (*Ann. Bot. [Rome], 17 (1928), No. 5, pp. 332–346, figs. 6*).—Presentation is made in systematic detail of the results of experimentation regarding the influence of the electro-magnetic field in the production of mutations among cucurbits, with reference to previous work done and methods employed by the author, some accounts of which have been noted[1] (E. S. R., 52, p. 29; 53, p. 329), and with reference also to related contributions by R. Savelli,[2] some of which are discussed.

Asexual inheritance of twin character of banana bunches, T. Mercado and J. M. Capinpin (*Philippine Agr., 18 (1930), No. 8, pp. 465–474, figs. 6*).—Observations at the College of Agriculture, University of the Philippines, upon the inheritance of twin bunch characteristics through two successive asexual generations of the banana gave evidence that tendency toward mutation is transmitted to the asexual progeny.

[Genetics investigations at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 162 (1929), pp. 16–18*).—The results of the following investigations are briefly noted (E. S. R., 60, p. 529):

The factors involved in the hatching of eggs.—Further study of the early development of the creeper fowl has demonstrated an embryonic malformation closely resembling the condition known in man as phocomelia, in which one or more of the long bones in the extremities appear to be missing. Such embryos appeared to represent homozygous creeper embryos which survive the lethal period at the fourth day of incubation. Other studies indicated that the factor responsible for the frizzle condition of the plumage is not a lethal factor.

A genetic study of inbreeding in fowls (White Leghorns).—Studies of the length and breadth of different bones indicated that the length of individual bones and the total bone length decreased materially from generation to generation of brother-sister mating, although the proportions of the different bones remained unchanged. There was distinct differentiation with regard to the shape of the cranium and proportions of the leg and wing bones occurring in different inbred families, thus indicating that the size and proportions of these skeletal parts are controlled by genetic factors.

The inheritance of morphological characters in poultry.—The same factor was found to be responsible for the creeper condition in fowls in the American, German, and Scotch lines. Purebred Frizzle fowls were found to differ from heterozygous birds in that the homozygous individuals were almost completely naked. The factors responsible for the frizzle and creeper characters were independent of each other. A comparison of chondrodystrophic embryos of creeper fowls and dwarf embryos due to thyroid deficiency indicated that in the latter type growth in general was arrested, the cranium shortened, and the proportions of different skeletal parts to each other were abnormal. Histological studies showed that there was an almost complete lack of endochondral ossification and that the marrow cells were decreased in number, completely missing, or degenerated. Studies of the character of regenerated feathers in silver spangled fowls indicated that in certain regions of the body males show a significantly higher regenerative activity of the feather follicles than do females. The variability in the size of the spangle in successive feathers from the same follicle was much greater in the breast and pelvic wings than in the throat. Spangled birds from crosses showed a more variable pattern size in regenerated feathers than purebreds. A study of the symmetry of the spangled feathers in the different regions demonstrated a definite distribution of two asymmetry types in the different regions of the two sides of the body.

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[1] See also Ann. Bot. [Rome], 16 (1926), No. 4, pp. 344–356; 17 (1926), No. 1, pp. 24–33; Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 2 (1925), No. 5–6, pp. 217–221; 3 (1926), No. 12, pp. 762–767.

[2] Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 2 (1925), No. 1–2, pp. 58–61; Ann. Bot. [Rome], 16 (1926), No. 4, pp. 309–343.

Investigations of the color and markings of horses and their inheritance [trans. title], H. Munckel (*Ztschr. Tierzücht. u. Züchtungsbiol., 16 (1929), No. 1, pp. 1–200, figs. 163*).—The inheritance of color in horses is explained on the basis of four pairs of independent Mendelian factors. *A* is a basic factor for yellow, its allelomorph *a* producing sorrel, *B* is for black, *C* for brown, and *D* for roan. *D* is epistatic to all the other factors, *C* is epistatic to *B* but hypostatic to *A* or *a*, and *B* is epistatic to *A* or *a*. In the presence of *D* the type of roaning is modified by the presence of factors *A*, *B*, or *C*. The proportion of gray hairs in the roan coat is further modified by other factors, but the higher grade of roaning seemed to be dominant.

Studies of the inheritance of white markings and spotting indicated that these were inherited as a single factor independent of the body color. They were expressed in different positions, but there was some agreement between the character of the markings of parents and offspring. The intensity of the color also was hereditary, the dull tones being dominant. White markings of various characteristics and differently distributed are described and illustrated. The possible colors of the offspring from matings between stallions and mares of different colors are summarized. The suggested explanations for the inheritance of the different color factors were compared with studbook data and found to be in relatively close accord, notwithstanding the possibility of error in stating the colors and the frequent uncertainty of the sire in case a mare may be served by more than one stallion.

The inheritance of cryptorchidism in goats, J. L. Lush, J. M. Jones, and W. H. Dameron (*Texas Sta. Bul. 407 (1930), pp. 23, figs. 3*).—This is a more complete account of the studies of the inheritance of cryptorchidism in goats previously noted (E. S. R., 62, p. 625). Data from the station flocks in which no ridgeling sires were ever used showed that 5.4 per cent of the males were ridgelings, a high percentage as compared with the frequency of cryptorchidism in other classes of animals. By line breeding to ridgelings it was possible to develop a flock in which nearly 50 per cent of the sons were ridgelings. The evidence suggested that while some cases of cryptorchidism were not hereditary most cases of this condition were, at least two pairs of autosomal factors being involved.

Anatomical studies of ridgelings showed that the right testicle was always the one retained. It was small in size and was attached by membranes to the abdominal wall, or to various organs.

Microscopic examination showed the presence of sperm in a few cases, but histological study of retained gonads showed complete degeneration of the germinal tissue.

An interesting case of close inbreeding in cattle [trans. title], O. Kronacher (*Ztschr. Tierzücht. u. Züchtungsbiol., 13 (1929), No. 3, pp. 377–385, figs. 10*).—The author describes a herd of cattle in which no new blood was introduced for 18 years. The individuals were vigorous, fertile, and good milk producers. One individual had but seven different ancestors in five ancestral generations and another but five different ancestors in four ancestral generations.

Lethal factors in domestic animals [trans. title], C. Wriedt (*Nord. Jordbrugsforsk., 1929, No. 4–7, p. 613–631, figs. 13*).—A review of cases of lethal factors which have been observed in domestic animals. Much of this material has been reported in an earlier paper (E. S. R., 54, p. 265) and in subsequent articles.

Ovogenesis in the Mammalia, O. Swezy and H. M. Evans (*Soc. Expt. Biol. and Med. Proc., 27 (1929), No. 1, p. 11*).—Studies of ovogenesis indicate that it occurs as a rhythmic process throughout adult life in the guinea pig, cat, dog, and man, and the number of ova produced and destroyed is enormous. New sex cells are produced by proliferations from the germinal epithelium in the form of invaginations and ingrowths of epithelial cords, which pass through the tunica albuginea after separation from the germinal epithelium. It appears that the mammalian ova have a shorter life span than any other group of cells in the body.

Maturation of human embryonic ova, O. Swezy and H. M. Evans (*Soc. Expt. Biol. and Med. Proc., 27 (1929), No. 1, p. 10*).—Studies of the maturation of the human embryonic ovum indicate that sexual differentiation occurs at the end of the seventh week of embryonic life, and is followed by simple growth and cellular multiplication up to the third month, at which time the early maturation phases begin. Between 3 and 5.5 months the prochromosomes are formed and disappear. The embryonic germ cells disappear before adult life is reached, and the ova developed during adult life do not pass through these maturation stages.

The spermatozoa production in horses.—I, The influence of frequent cohabitation on sperm production [trans. title], W. Polowzow (*Pflüger's Arch. Physiol., 218 (1927), No. 3–4, pp. 374–385*).—Studies of the quantity and quality of spermatozoa produced by four stallions with varying intervals between service indicated that the rest period between services for normal spermatozoa production was 48 hours. Daily mating caused an increase in the percentage of immature sperms. The percentage of immature sperms increased as the daily use of the stallion continued. When there were long intervals between mating, the sperm collected in the epididymis degenerated and many were nonviable. Sexual stimulation did not appear to influence sperm production, and the secretions of the accessory sex glands were produced independently of the production of spermatozoa.

The spermatozoa production in horses.—II, The influence of nutrition on spermatozoa production [trans. title], W. Polowzow and W. D. Nagajew (*Ztschr. Tierzücht. u. Züchtungsbiol., 13 (1929), No. 3, pp. 395–414*).—A 10-year-old stallion was used for this study, which was continued over four periods in which the ration was modified as follows: A basal ration of 15 lbs. of oats and 15 lbs. of hay was fed throughout which was supplemented in the second period with 2 lbs. of dry peas and 3 lbs. of linseed cake; in the third period the basal ration was supplemented with 10 hen's eggs and 5 lbs. of wheat bran, and in the fourth period with all four of the supplements. The average results per ejaculation for the successive periods were, respectively, as follows: Amount of semen, 45, 50, 49, and 50 cc.; percentage of living sperm 54, 51, 62, and 74; spermatozoa per cubic millimeter of semen, 54,264, 78,890, 157,400, and 147,560; and total sperm production 2,885,701,430, 4,141,220,000, 8,085,507,000, and 7,080,405,400. The results indicate that sperm production during the breeding season may thus be greatly increased by supplementing the ration with suitable proteins and lipoids.

Spermatogenesis following early ovariotomy in the Brown Leghorn fowl, L. V. DOMM (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 119 (1929), pp. 171–187, figs. 4; Ger. abs., pp. 185, 186*).—A more complete account of the investigations previously noted (E. S. R., 62, p. 325), with some additional data. Seven of the 90 testis-like right gonads developing after ovariotomy showed that active spermatogenesis was going on. The birds were ovariotomized at ages ranging from 1 to 58 days.

The production of female genital subsidiary characters and plumage sex characters by injection of human placental hormone in fowls, M. JUHN and R. G. GUSTAVSON (*Jour. Expt. Zool., 56 (1930), No. 1, pp. 31–61, pls. 5, figs. 2*).—Studies of the influence of extracts of human placenta on feather development of cocks and capons and on oviduct development in immature pullets are reported.

In two experiments in which immature pullets were injected with 30 rat units of placental hormone per day for 10 days, it was found that in the first experiment the average weight of the oviducts of the treated birds was 2.52 gm. and of the controls 0.19 gm. Older birds were used in the second experiment, in which similar though less striking results were obtained. Body weight was also stimulated by the injections. In a third experiment injections of 4 rat units of the hormone per day for 10 days did not induce growth.

Injections of 60 rat units per day into cocks and capons of which portions of the plumage had been plucked caused the newly developing feathers to be of the female type. Reducing the dosage to 30 rat units per day caused modifications in the female direction, but the effects were not as distinct as with the heavier dose. Feathers developing immediately after the treatment stopppd were invariably of the male type. The testis hormone stimulated comb growth, but had no influnce on the type of plumage.

A crystalline substance of the hypophysis which promotes follicular growth, P. E. CLAUS (*Soc. Expt. Biol. and Med. Proc., 27 (1929), No. 1, pp. 29, 30*).—The author reports the isolation of the crystalline substance from an acid alcohol extraction of desiccated anterior lobe of the hypophysis which induces precocious sexual maturity.

FIELD CROPS

[Field crops work in Georgia, 1929] (*Georgia Sta. Rpt. 1929, pp. 7–13, 23, 24, figs. 4*).—Cotton fertilizer recommendations were in harmony with experimental findings noted earlier (E. S. R., 61, p. 118), indicating for cotton on heavy soils 600 lbs. per acre of 6–6–3 fertilizer (2–2–1 ratio), with certain modifications where nitrogenous top-dressings are to be applied. The pH of the soil was increased by sodium nitrate and decreased by ammonium sulfate. Where half the nitrogen was applied as sodium nitrate and half as ammonium sulfate the pH was lowered, but not nearly so much as when ammonium sulfate was used alone. Great quantities of ammonium sulfate so lowered the pH that cotton failed to grow. Rather inconclusive top-dressing tests with potassium chloride suggested that with early-planted cotton and conditions favoring a middle and top crop more potassium than is usually recommended might pay. Neither phosphorus nor potassium markedly affected the number of bolls per pound or the lint per 100 bolls, while the nitrogen and the quantity of fertilizer per acre were quite effective, the heaviest rates producing few bolls per pound and more lint per 100 bolls.

Practically no difference was found in the green weight, dry weight, or height of cotton plants grown for six weeks on ammonium sulfate and potassium nitrate as sources of nitrogen in water culture. The reaction of the expressed sap of plants grown on the two forms of nitrogen did not differ at either three or six weeks of age, although a slight difference was observed in buffer properties. The concentration of nitrate nitrogen in the sap of plants three and six weeks old grown in the nitrate solution was much higher than the concentration of ammonia nitrogen in the sap of plants grown in the ammonia solution. At the end of the growth period analyses indicated that the introduction of the basic ammonium ion into the culture solution as a nitrogen source in place of the acid nitrate ion slightly increased the absorption of phosphates and possibly sulfates but depressed the absorption of the other principal bases, e. g., the nitrate plants contained 100 per cent more calcium and 60 per cent more magnesium. The solutions used were high in concentration of potassium, and its absorption was very heavy. With this high potassium absorption came a tendency of the growing plants to increase the H-ion concentration of the nitrate solution. Cottonseed delinted with sulfuric acid produced 236 lbs. per acre more seed cotton than undelinted seed.

Kobe lespedeza sown in small grains made between 1 and 2 tons of air-dried hay per acre. While satisfactory stands were obtained from as little as 10 lbs. of seed per acre, it appeared safer to use 20 lbs. Although top-dressing with lime and phosphates did not seem to increase the yields, rolling the land after seeding enhanced hay production, probably due to the improved stand.

With winter legumes, nitrogen production was highest in the earliest (September 21) plantings, especially with Monantha vetch and crimson clover, increased with the rate of seeding, and was decidedly affected by time of cutting. In general the quantity of nitrogen rose 50 to 75 per cent from March 10 to 20. Austrian Winter field peas at the rate of 20 lbs. per acre produced 41 lbs. of nitrogen when cut March 20 and 131 lbs. when cut April 20. The nitrogen percentage ranged from 2.91 in crimson clover to 4.32 in hairy vetch, and acre production of nitrogen in tops ranged from 54 lbs. in Augusta vetch to 100 lbs. in Monantha and hairy vetch.

Breeding work with wheat, oats, rye, corn, and soybeans and fertilizer tests with corn are also noted briefly.

[Agronomic experiments in Guam], C. W. Edwards and J. Guerrero (*Guam Sta. Rpt. 1928, pp. 2, 3, 14–18*).—Cultural and fertilizer trials with forage grasses and variety tests with cowpeas, pigeon peas, legume cover crops, adlay, rice, sweetpotato, edible canna, taro, and cassava are reported on in continuation of earlier work (E. S. R., 59, p. 523; 60, p. 813.

On certain upland sword grass (*Miscanthus floridulus*) areas too rocky for ordinary cultivation, tests showed that Paspalum (*P. dilatatum*) grass may be grown without previous preparation or later cultivation except cutting the sword grass when Paspalum is planted and at intervals until well established. Plats receiving barnyard manure and lime in combination gave higher yields of Napier grass and Japanese cane than when these materials were used singly, whereas Guatemala grass receiving lime alone gave the best results. Applications of manure alone gave the second highest yields of Napier grass, Guatemala grass, and Japanese cane. The ground local limestone proved to be a better treatment for Napier grass than the locally burned lime. When several coarse forages were compared on a limestone hillside, Napier grass produced the most and Japanese cane the least green forage. On lowland clay soil Guatemala grass was better able to compete with other grasses and weeds than was either Napier grass or Japanese cane.

The most troublesome pasture pests were aroma (*Acacia farnesiana*) and the weeds *Cassia occidentalis* and *Hyptis capitata.* A dense plat of aroma was killed by malagas (*Cassytha filiformis*), a parasitic vine, which in turn was easily destroyed by burning. Efforts to propagate the parasitic plant by seed have failed so far.

In a comparison of cover crops cowpeas efficiently covered a test area in 64 days from planting, Alabama velvetbean in 84 days, and Black Mauritius velvetbean in 94 days. The latter made the densest and most efficient cover crop.

[Crops experiments at the North Louisiana Substation, Calhoun, in 1928 and 1929], S. Stewart (*Louisiana Stas. Bul. 204 (1930), pp. 5–7, 8, 9–11*).—Delfos No. 2, Express 317, Dixie Triumph, and D. & P. L. No. 4 were found to be cotton varieties of merit, and prolific corns, as Hastings, Mosby, Whatley, and Cocke, made best yields. Variety tests with clovers and soybeans are noted briefly.

Fertilizer trials with cotton indicated the use of about 600 lbs. per acre of a 7–10–4 mixture for the hill region of Louisiana. Supplying 30 lbs. of nitrogen per acre, sodium nitrate with cottonseed meal, followed by two proprietary carriers produced the highest yields among different nitrogen sources. Corn alone made several more bushels per acre than corn with soybeans, whereas cotton after corn alone made 1,050 lbs. per acre and after the combination 1,295 lbs.

[Agronomic investigations in the Virgin Islands, 1929], J. B. Thompson and M. S. Baker (*Virgin Islands Sta. Rpt. 1929, pp. 2, 3, 9–15, figs. 4*).—Experimental work with field crops (E. S. R., 62, p. 219) reported on included breeding work and variety tests with sweetpotatoes and sugarcane and trials of miscellaneous grasses and legumes for forage and legumes for green manures.

Promising sugarcanes included some of the P. O. J. varieties and the seedlings S. C. 26/158, S. C. 26/102, and S. C. 26/137. No high degree of correlation was apparent between the number of canes in the original stool grown from the seed and those in stools of the same variety when grown from cuttings. It seemed that weather and soil conditions rather than some inherent character control the size of stool. Attempts to control pollination in cane breeding were not successful, probably because of the difficulty of obtaining arrows when desired.

Alfalfa, *Lespedeza* sp., bur clover, alsike clover, crimson clover, red clover, and white clover were not found well suited to local conditions. Sweetclover (*Melilotus alba*) was more promising than these legumes, but even its success is questioned. The cowpea has been very desirable for both humans and livestock, the Victor, Brabham, and Groit varieties excelling in order. Pigeon peas and velvetbeans, especially the Osceola velvetbean, promised to be valuable for forage. Outstanding forage grasses included Japanese cane, Napier grass, Guatemala grass, and sorghums, as Saccaline and Texas Seeded Ribbon sorgos, and Blackhull kafir. Guinea grass, Barbados sour grass, Para grass, Dallis grass, Jaraguá, centipede grass, Bahia grass, Igoka grass, Mexican grass, and molasses grass all had points of value for pastures. Sunn hemp and the jack bean made good green manures.

[Agronomic experiments in Wyoming] (*Wyoming Sta. Rpt. 1929, pp. 6–8, 18–20, 34, 36, 37, 41, 42, 43*).—Crop experiments (E. S. R., 60, p. 732) reported on from the station and State farms embraced variety trials with wheat, oats, barley, corn, alfalfa, potatoes, and miscellaneous grasses and legumes; comparisons of certified and noncertified potato seed; tests of forage mixtures for hay; cultural trials with corn, wheat, barley, beans, and sugar beets; and crop rotations.

Samples of the first and second cuttings of alfalfa hay taken at Dayton at the approximate altitude of 4,500 ft., Worland 4,500, Lander 5,000, Grover 6,000, and southwest of Laramie 8,000 ft. were found to contain, respectively, 16.1, 17.3, 17, 21.1, and 18.1 per cent of crude protein in the first cutting and 17.3, 17.44, 18.6, 19.1, and 18.6 per cent in the second cutting. In general the percentage of crude fiber, a measure of the woodiness, was in inverse order from the protein. On the whole the percentages of ash and crude protein in these samples were rather high.

Analysis of forage taken at different times in the winter of 1927 and 1928 on the range showed that although the protein was comparatively low in the grasses there evidently was no systematic loss from January to April, although there was a slight loss of carbohydrates, possibly due to a leaching of sugars. Leaves of sagebrush, saltbush, shad scale, and greasewood when dried had a protein content not differing greatly from that of alfalfa hay. O. C. McCreary, studying the oil of the sagebrush leaves, found that ether extract, mostly oil and fat, amounted to 19 per cent of the dry material in the leaves. He observed that steaming the sagebrush leaves removes the bitter flavor unpalatable to livestock.

With the exception of the increased proportion of the dead leaves, the food value of the grass on the Laramie plains remained about the same during the summer. The increasing number of dead leaves as the summer progressed made the total value of a unit weight of the grass correspondingly lower, to a minimum when all the leaves were dead, this decrease being most marked in the quantity of crude protein. Plats mowed oftenest, every three or four weeks, showed the highest value, but McCreary held that the total amount of feed produced during the season was less. Grass from plats ungrazed through the winter appeared to be comparatively poor because of the mixture of dead grass. Dead grass remaining after a year was less nutritious than the newly dead grass that had grown the previous summer. Immature grass ground cured in the plats previously pastured contained more protein than fully matured ripe grass.

Permanent pastures, G. B. Mortimer and G. Richards (*Wisconsin Sta. Bul. 414* (*1930*), *pp. 26, pls. 8, figs. 7*).—Improvement practices for permanent pastures in Wisconsin are advised from experiments of which the progress has been noted (E. S. R., 63, p. 32).

The investigation demonstrated the positive relation between available phosphorus in the soil and yield of forage. Worn pastures responded decidedly to applications of phosphorus and potassium and to liming. Proper fertilization, reseeding where needed, judicious grazing, control of weeds, and harrowing to spread droppings are considered essential to improvement of pastures. The merits of the Hohenheim system of intensive pasture management are discussed briefly.

✓ **Alfalfa** (*Connecticut Storrs Sta. Bul. 162* (*1929*), *pp. 4, 5*).—This is a brief note on the year's work.

Further evidence (E. S. R., 60, p. 533) of the importance of potassium for maintaining stands and yields of alfalfa was obtained. Chickweed, witch grass, and shepherd's purse in particular were reduced decidedly by withholding phosphatic fertilizers. Nitrogen either from manure or fertilizers did not increase alfalfa yields and tended to encourage competition of weeds, particularly the grasses. Sulfur treatments were not beneficial to alfalfa, and the addition of 200 lbs. per acre of flowers of sulfur was positively injurious, even on land very heavily limed. Alfalfa seeded with Hubam sweetclover yielded more than when seeded with oats.

✓ **Alfalfa** [trans. title], H. Bois and A. Mathieu (*Min. Agr. Prov. Québec Bul. 101* (*1930*), *pp.* [*34*], *figs. 32*).—A practical and well illustrated account in French of practices suitable for growing alfalfa in Quebec.

The effect of manurial deficiency upon the mechanical strength of barley straw, F. R. Tubbs (*Ann. Bot.* [*London*], *44* (*1930*), *No. 173*, *pp. 147–160*, *figs. 5*).—The effect of fertilizer deficiency upon the strength and anatomical structure of Plumage Archer barley straw was studied at the University of London. The force in gram weight required to crush 1 cm. length of stem radially was taken as a measure of strength.

The strength of succeeding internodes of fully fertilized plants fell off rapidly. Deficiency of nitrogen and phosphorus resulted in a large increase in the strength of the lower internodes, whereas potassium starvation decreased the strength of the lower and increased that of the middle internodes. The effects of deficiency of nutrients were most marked in the lower internodes, the upper ones approximating normal.

Variation in the thickness of the mechanical tissues followed that of strength, but was not enough to account for the large differences observed. The fall noted in strength of succeeding internodes appeared due both to a decrease in the efficiency of the mechanical tissues and also to a decrease in their actual amount.

Equations connecting strength and the morphological status of the internode gave a good fit in the completely fertilized, nitrogen-deficient, and phosphate-deficient series. The relation between strength and internode number was logarithmic, the strength of each internode being a constant fraction of that next below, within the limits of the error of the experiment, the value of the fraction being dependent on the type of fertilization. The ratio of the external radius to the internal radius of the mechanical tissues was found constant for internodes of the same status independent of nutrients. It appeared that the mechanical function of the elements composing them is determined at a very early stage.

The effects of various legumes on the yield of corn, C. A. Mooers (*Tennessee Sta. Bul. 142* (*1930*), *pp. 16*, *figs. 2*).—Further experiments (E. S. R., 57, pp. 128, 129) on the effects of legumes on subsequent corn yields were made at the station and at the West Tennessee Substation at Jackson.

Crimson clover in its effect on the corn crop following was much superior to other summer legumes, and its influence on corn production was not limited to the first year. When it was cut for hay only slightly less corn was made thereafter than where the whole crimson clover crop was turned under. Corn averaged 34 bu. per acre the next year after cowpeas, soybeans, and velvetbeans turned under for green manure and 29.4 bu. after corn, sorghum, and millet handled likewise, although corn yields differed little in the second year.

During 10 years at Jackson sweetclover cut at least once for hay was the most effective on the following corn yields, which totaled per acre for five crops on sweetclover plats 272.4 bu., on lespedeza plats 241.4 bu., on orchard grass plats 220.6 bu., and continuous corn 154.9 bu. A good crop of lespedeza unharvested was about as effective as a poor crop of sweetclover cut twice for hay, once in the fall and again the next spring. After alfalfa, red clover, and clover and grass cut for hay for one season, corn averaged during 5 years 52.6, 45.1, and 40.2 bu. per acre, respectively, and after two seasons of the legumes 54.1, 43.2, and 41.6 bu. The effects of the preceding hay crops were evident for at least three years after the sod was plowed.

Oat production and varieties for Wyoming, A. F. Vass and G. Hartman (*Wyoming Sta. Bul. 170* (*1930*), *pp. 40*, *figs. 9*).—Cultural methods and field practices and varieties for the growing of oats under dry land and irrigation conditions are recommended from the results of extended studies by the station.

In the dry farming sections of the State spring-seeded oats upon disked corn or potato ground have been very profitable, and on the irrigated lands oats have given good returns when seeded on potato or sugar beet ground. Oats yields have been increased greatly by the use of a rotation of alfalfa, potatoes, and grains. The best results were secured when potatoes followed fall-crowned alfalfa and were in turn followed by oats. It appeared that for oats irrigated land should be fall plowed to permit early seeding, although disking and floating are enough if oats follow a cultivated crop. Seeding trials indicated early sowing, i. e., early in April, of 2.5 to 3 bu. per acre, with lighter rates on dry land where oats are used as a nurse crop.

Varietal trials since 1920 suggested for irrigated lands Banner, Silvermine, Swedish Select, and Markton, and also Kherson if an early small oats is wanted. Kherson and Banner seemed adapted to dry land farms.

Report of the Rice Experiment Station for the years 1928–1929, J. M. JENKINS (*Louisiana Stas. Bul. 205 (1930), pp. 3–12*).—Experiments with rice at Crowley, in cooperation with the U. S. Department of Agriculture (E. S. R., 54, p. 35) embraced fertilizer tests, variety trials, and cultural, seeding, and rotation experiments. Investigations on the velvetbean caterpillar attacking soybeans are noted on p. 157. The rice market and the effect of the weather on the rice crop are also commented on briefly.

Fertilizer experiments during 10 years indicated that fertilizers may be of doubtful value for rice. However, they may be applied best to rice in rotation, especially with soybeans. Rice appeared to need plenty of nitrogen and potassium and very little phosphorus. The greatest yield increases came from acre applications of 100 lbs. each of ammonium sulfate and potassium sulfate. Raw rock phosphate probably should be applied in rather large quantities and with intervals of several years between applications.

Rice after soybeans averaged 500 lbs. per acre more than after pasture. In the rotations including cotton, the highest average rice yield came from plats in which soybeans were included in a 3-year rotation and the lowest yields from plats in rotation with fertilized cotton. The residual fertilizer seemed to affect adversely the rice following, due apparently to the large amount of superphosphate used on the cotton. Rice yields after soybeans averaged decidedly higher when only the soybean seed was harvested and much lower when rice followed uncultivated, closely drilled soybeans turned under after maturity. In rotation with soybean varieties cultivated in 4.5-ft. rows, rice yields averaged much greater following Barchet soybeans than after Biloxi or Otootan.

It did not appear necessary to plow land for rice after a crop of cultivated soybeans. Rice sown in water 4 in. deep made somewhat better stands than in 2- or 6-in. depths. March 15 was superior to later seeding dates, and the germination percentage of Blue Rose, Early Prolific, Fortuna, and Honduras rice varieties ranked in order. The varieties Fortuna, Rexoro, and Delitus, distributed to rice farmers, had certain desirable characteristics.

Root development in rice under different conditions of growth, R. L. SETHI (*India Dept. Agr. Mem., Bot. Ser., 18 (1930), No. 2, pp. 57–80, pls. 4, figs. 4*).—The root system of the rice plant under different growth conditions was studied at the Botanical Farm at Cawnpore.

During the life of the plant two types of roots were noticed, including thin, brown, flaccid, branched roots and bold, white, almost unbranched roots. The development of the root system was quite vigorous before flowering, whereas it became weak and flaccid after the flowers appeared, suggesting that all nutrients should be provided before flowering when the root system is most efficient. Varietal differences in root development might aid in selecting varieties suited to particular localities.

The texture of clay seemed to suit root development better than that of loam, gravel, and sand. Temperature exerted a pronounced influence, summer and rainy seasons appearing most suitable for growth, while cold was inhibiting. The growth was the better as the moisture content of the soil increased, whereas ripening was delayed. Anatomical observations on the roots showed that rice is not quite an aquatic plant as is usually inferred from its large water requirement and because it is generally grown under swamp conditions. Aeration appeared absolutely essential for the healthy development of the plant.

Selection characters as correlated with percentage of sucrose, weight, and sucrose content of sugar beets, D. A. PACK (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 6, pp. 523–546, fig. 1*).—Data for 50 characters were recorded at the United States Plant Field Station, Salt Lake City, Utah, on 496 individual beets of 5 known lines grown and examined under optimum conditions, measured in standard units, and analyzed immediately after harvest. More than 500 total, multiple, and partial correlation coefficients were calculated, considering the percentage of sucrose, the weight, and the sucrose content of the beet with 47 selection characters. In general the total correlation coefficients for each separate line resembled the corresponding total correlation coefficient for the combined material.

The conclusion that the physiological correlation of the sucrose percentage with the weight of the beet was negative and significant was strengthened by the fact that nearly all of the characters correlated positively with the sucrose percentage were correlated negatively with the weight of the beet. No partial correlation calculated showed a positive relation between the sucrose percentage and the weight. Percentage of sucrose was found to be correlated significantly and positively with sucrose content.

Since many of the correlations indicated a strong association of weight with sucrose content, the weight of the beet evidently should be given more consideration. The percentage of sucrose was not correlated significantly with the available space allowed a beet in the field. It appeared that as weight and sucrose content of the beet increased with the available space sugar beets planted for selection should be spaced uniformly to the optimum distance for the strain. Aside from the polariscope, the refractometer reading seemed to be the most reliable selection character to be considered in improving the percentage of sucrose content in the beet. The number of leaves was shown to be the most important selection character influencing the weight of beets.

The selection characters are held to be adapted to field studies and valuable in the improvement of sugar beets.

Fertilizers for tobacco, J. JOHNSON and W. B. OGDEN (*Wisconsin Sta. Bul. 413* (*1930*), *pp. 31, figs. 17*).—Formulas and rates, methods, and conditions of application of fertilizers are suggested for the Wisconsin tobacco grower. With a 2–12–16 fertilizer 1,500 to 2,000 lbs. per acre may be recommended on new land not manured; 800 to 1,200 lbs. on new land supplementing coarse manure; and 800 to 1,200 lbs. without manure, or 300 to 600 lbs. with a thin coating of manure on old tobacco land that has shown ability to grow good crops. With higher grade fertilizers correspondingly smaller applications per acre may be made. Potassium chloride may supply up to one-third the potassium in the formula, with high-grade potassium sulfate furnishing the remainder. Other factors favoring best results from fertilizers include land free from black root rot or harmful effects of rotation, suitable soils, proper application of the fertilizer, and the adoption of a practical fertilizer program.

Rôle of chlorine in nutrition and growth of the tobacco plant and its effect on the quality of the cured leaf, W. W. GARNER, J. E. MCMURTREY, JR.,

J. D. Bowling, and E. G. Moss (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 7*, *pp. 627–648*, *figs. 2*).—Experiments concerned with the effect of chlorine in stimulating growth in tobacco, its rôle in influencing water relations and nutritional processes in the plant, and its relation to color, combustibility, and other characteristics of the cured leaf were made by the U. S. Department of Agriculture cooperating with the Maryland and North Carolina Experiment Stations. Certain phases of the work at Oxford and Reidsville, N. C., were in conjunction with fertilizer research detailed in an earlier report (E. S. R., 58, p. 328).

On light sandy and sandy loam soils a moderate supply of chlorine in the fertilizer was found to stimulate the growth of tobacco. When dolomitic limestone was applied to the soil the gain in tobacco yield due to the chlorine was reduced. Under the test conditions from 20 to 30 lbs. of chlorine per acre sufficed to give about the maximum stimulation of this element. Potassium as sulfate was as readily absorbed by the plant as in the form of chloride. However, the chlorine ion was absorbed readily by the plant while only a comparatively small proportion of the sulfate ions were taken up.

The North Carolina tests, supplemented by studies at Upper Marlboro, Md., on soils of the Collington series, demonstrated that the presence of chlorine in the soil may enable the plant to absorb more readily the necessary quantity of magnesium to meet nutrition requirements, while the presence of chlorine in the tissues of the leaf enables it to resist injurious desiccation. It was observed that a too liberal supply of chlorine in the soil, i. e., in excess of 100 lbs. per acre and in some cases as low as 40 to 60 lbs., may produce decided injury to the plant, apparently not by direct toxic action but by serious interference with carbohydrate metabolism. Apparently chlorine injury in the field is most likely to occur on light sandy soils which have only slight buffering properties. That weather conditions also greatly affect the results, even on the same soil, was also indicated. The presence of chlorine in the tissues did not seem to interfere appreciably with the hydrolysis of starch or the utilization or transport of the products of hydrolysis which normally take place in association with loss of water in the curing process.

As to quality the chlorine content of the cured leaf may affect its properties either favorably or adversely, depending on the quantity of the chlorine present, the use of the tobacco, and the stage in handling and manufacturing operations which it has reached. Exposure of leaf of chlorine-fertilized tobacco to various relative humidities showed that the presence of chlorine increases the moisture content of the cured leaf, which may affect more or less its elasticity, its combustibility, and its keeping qualities. Chlorine tends to injure the combustibility of the leaf, partly due to the fact that its presence reduces the quantity of potash which may exist in the leaf in combination with organic acids. Excess chlorine was observed to produce muddy colors in the cured leaf, often with considerable splotching in which green, yellow, and brown are intermingled. A high chlorine content in the fertilizer tends to injure the toughness and elasticity of the leaf.

Judged by expert buyers from appearance, leaf tobacco grown with a limited supply of chlorine showed a moderate increase in market value. Under test conditions maximum effects in this direction have been obtained with 20 to 30 lbs. of chlorine per acre. With an excess of chlorine in the fertilizer, the market value of the leaf has been materially lowered.

Varietal tests with wheat at the Sheridan Field Station, R. S. Towle (*Wyoming Sta. Bul. 171* (*1930*), *pp. 11*, *fig. 1*).—In comparisons in cooperation with the U. S. Department of Agriculture during the period 1917–1929 no spring wheat grown before 1925 surpassed Marquis for the section, but Ceres outyielded Marquis by 3.6 bu. per acre for the years 1925 to 1929, inclusive. Kubanka, Peliss, and Akrona durum wheats have approximated the yields of Marquis. However, durum varieties showed no advantages over hard spring varieties tested and were less salable. Kharkof led the winter wheats over the whole period, although Montana No. 36 and Kanred were slightly superior in yield for 1925 to 1929.

Commercial agricultural seeds, 1929, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 134 (1929), pp. 73–109*).—The purity, germination, and weed seed content are tabulated for 534 samples of agricultural seed collected from dealers in Maine during 1929.

Seed inspection, P. H. Smith, O. W. Kelly, and C. L. Beane (*Massachusetts Sta. Control Ser. Bul. 49 (1929), pp. 55*).—The purity, germination, and weed seed content, and, with certain legumes, the hard seed contents are tabulated for 485 samples of agricultural seed collected in Massachusetts during the year ended October 1, 1929. Samples of alfalfa, red clover, sweetclover, and onion seed were also tested for type.

Results of seed and legume inoculant inspection, 1929, J. G. Fiske (*New Jersey Stas. Bul. 492 (1930), pp. 90*).—The purity, germination percentage, and other data are tabulated for 1,524 official samples of seed of field crops, vegetables, and lawn mixtures obtained from dealers in New Jersey during 1929, and the crops, inoculation purity, number of organisms, and viabilities are shown for 74 official samples of legume inoculants.

HORTICULTURE

[Horticulture at the Guam Station], C. W. Edwards and J. Guerrero (*Guam Sta. Rpt. 1928, pp. 3, 4, 19–22, figs. 3*).—The usual annual report on horticultural activities (E. S. R., 60, p. 820).

Considerable work was done in the testing, propagation, and distribution of desirable forms of oranges, avocados, bananas, and other plants. Of various types of plant material used in propagating bananas, sword leaf and round open leaf suckers taken from young clumps rated first in production. Some evidence was obtained that cabbage seed from southern United States is better adapted to Guam than is that grown in the North. Data are presented on cabbage and onion yields and on the results of tomato breeding.

Report of the Fruit and Truck Experiment Station for the years 1928–1929, B. Szymoniak (*Louisiana Stas. Bul. 206 (1930), pp. 8*).—A brief report on the results of various fertilizer, cultural, and varietal tests with small fruits, oranges, pecans, and other plants. A complete fertilizer was found most valuable for the strawberry, and it is recommended that this should be applied at two seasons, namely, during runner formation and again when plants are set out in the autumn, supplementing with a top-dressing of sulfate of ammonia or nitrate of soda in February. Paper mulch did not prove satisfactory for strawberries because of its decay during winter. Treating the soil with hydrated lime proved beneficial, while calcium sulfate reduced yields and growth.

Of muscadine grapes the Thomas proved adapted to sandy loam soils and was valuable for producing juice and preserves. The MacDonald blackberry was successfully shipped to northern markets under refrigeration. The *Hicoria aquatica* proved a satisfactory stock for pecans.

[Horticulture at the Virgin Islands Station], J. B. Thompson, C. L. Horn, and W. M. Perry (*Virgin Islands Sta. Rpt. 1929, pp. 3, 4, 6–9, 16, 17, figs. 2*).—Among plant introductions of the year were included strawberries, vinifera grapes, and various ornamentals. Improved varieties of banana, coconut, avocado, orange, and other plants were distributed for trial. Attempts to grow tomatoes, eggplants, peppers, and onions for the New York market were generally unsuccessful from an economic viewpoint. Marglobe tomatoes grown for seed production yielded 12.35 lbs. of seed per ton of ripe fruit. Avocados of the Family and Trapp varieties fruited heavily. Evidence was obtained that a 2 per cent paraffin oil emulsion applied to fig trees every 60 days will control pustule scale. Cuttings of the Muscat of Alexandria grape received from California made vigorous growth.

The effect of various spray materials on the pollen of fruit and ornamental plants [trans. title], A. NIETHAMMER (*Gartenbauwissenschaft, 1 (1929), No. 5, pp. 471–487*).—Various spraying materials, including lead arsenate, nicotine sulfate, and sulfur compounds, were added in solutions of 1 per cent to cultural media of 2.5, 5, 10, and 20 per cent sugar solutions held at a temperature range of from 20 to 26° C. Records taken on the growth of a large number of pollens, including filbert, chestnut, apricot, cherry, apple, pear, plum, lilac, rose, and peony, showed that the species differed decidedly in their resistance to injury and that the various spray materials differed greatly in toxicity. Among harmless materials was nicotine, while lead arsenate was frequently injurious and certain other materials were very definitely toxic. As a general conclusion, the author suggests that spray materials should be considered harmful to pollination and that spray programs should be planned with this fact in mind.

Insecticides and fungicides, 1929, J. M. BARTLETT et al. (*Maine Sta. Off. Insp. 134 (1929), pp. 110–116*).—The results of the analyses of 91 samples of insecticides and fungicides collected and examined in 1929 are presented in the same form as in the preceding year (E. S. R., 61, p. 228).

The home vegetable garden, A. M. BINKLEY (*Colorado Sta. Bul. 357 (1930), pp. 45, figs. 18*).—Practical information is given upon the planning, planting, and care of the home vegetable garden.

Paper mulch for the vegetable garden, R. MAGRUDER (*Ohio Sta. Bul. 447 (1930), pp. 60, figs. 14*).—Tests in 1928 of six papers, three special mulching and three building materials, upon 31 crops of vegetables led to the general conclusion that paper mulch has merit under Ohio conditions for the culture of early, quick-maturing crops, warm season crops, and during periods of moisture shortage. Of the 31 crops grown, 28 produced as large or larger total yields from the black paper mulched area as from cultivation. Onions from seed, head lettuce from seed, and late turnips produced slightly less with paper mulch. Vegetables grown with paper were generally of better quality than the tilled crops.

Of the various factors concerned in the beneficial effects of paper mulch, soil temperature is believed the most potent, since the daily mean of the soil under the paper was as much as 6.5° F. higher than the cultivated soil and was higher 95 per cent of the days in May, June, and July. In respect to soil nitrates, there were found no consistent differences in the nitrate nitrogen content of the two areas. Although moisture was more abundant under paper, there was adequate moisture during the first 2.5 months in both environments.

Of the six papers, one of the three building materials proved harmful, and none of the six were considered worth saving for a second season's use. Cost of paper and difficulty of applying are considered serious handicaps at the present stage.

Rotation experiments with vegetables [trans. title], F. VON KOTOWSKI (*Gartenbauwissenschaft, 1 (1929), No. 5, pp. 500–516, figs. 5*).—In studies at the Institute of Olericulture, Warsaw, Poland, it was noted that tomatoes and cabbage were decidedly in need of systematic rotation on account of plant diseases, but that the onion did not require crop rotation.

Effects of defoliation and root pruning on the chemical composition of sweet-corn kernels, C. W. Culpepper and C. A. Magoon (*Jour. Agr. Research [U. S.], 40 (1930), No. 6, pp. 575–583*).—Utilizing as plant material Stowell Evergreen sweet corn grown at Arlington Experiment Farm, Virginia, the authors found that at certain stages of development defoliation had a very marked effect on the chemical composition of the kernels. The effect was most marked in the kernels of plants defoliated 10 and 15 days after silking and was manifested in a significantly lower content of sugar and acid-hydrolyzable substances, as determined in samples taken 20, 25, and 30 days after silking.

On the other hand, partial or nearly complete defoliation of corn plants at the time of silking caused but little difference in the chemical composition of the developing grains but did materially decrease yields, as shown in small ears and fewer kernels than in the controls. Root pruning at this stage resulted in high total solids and an apparent increase in the rate of maturity. Defoliation was more harmful than root pruning.

Defoliation later than 15 days after silking was progressively less harmful as the treatment was delayed. Concerning the physical effects of defoliation, there was observed a marked difference in the behavior of kernels, some developing normally and others ceasing development, leading to the suggestion that in the presence of inadequate nutrients a few kernels monopolize the nutrient supply. The practical aspects of injury to the corn plant are discussed.

Geneva, a greenhouse cucumber that develops fruit without pollination, L. R. Hawthorn and R. Wellington (*New York State Sta. Bul. 580 (1930), pp. 11, fig. 1*).—The parentage, characteristics, and value of a cucumber originated at the station as a selection from the fifth generation of a cross of Arlington White Spine and Rochford Market are discussed. This cucumber is deemed especially desirable for greenhouse culture on account of its capacity for producing fruits readily without pollination. Observations on inheritance of the parthenocarpic tendency indicated that this character if not completely recessive is at least partially so.

Growing cucumbers for pickling, J. H. Beattie (*U. S. Dept. Agr., Farmers' Bul. 1620 (1930), pp. II+18, figs. 9*).—A general discussion on the distribution of the industry, cultural considerations, methods of harvesting and handling, and economic features.

Morphology and anatomy of the radish root [trans. title], H. Golińska (*Gartenbauwissenschaft, 1 (1929), No. 5, pp. 488–499, figs. 6*).—A discussion of growth and structure in the common garden radish, based on studies conducted at the Institute of Olericulture, Warsaw, Poland.

Studies in fruit bud formation [trans. title], E. Johansson (*Sveriges Pomol. För. Årsskr., 31 (1930), No. 1, pp. 1–26, figs. 20; Eng. abs., pp. 24–26*).—A report on the results of cytological investigations at Alnarp, Sweden, upon the time of fruit bud differentiation in various apple, pear, plum, and cherry varieties. Earlier differentiation was uniformly observed in the earlier ripening varieties.

A furfural-yielding substance as a splitting product of protopectin during the ripening of fruits, C. M. Conrad (*Plant Physiol., 5 (1930), No. 1, pp. 93–103*).—Continuing studies at the University of Maryland (E. S. R., 56, p. 644) on the pectic changes in ripening fruit, the author again noted that protopectin decreases and that soluble pectin increases during ripening. Concurrently with the development of soluble pectin there was observed an increase in polysaccharide, as represented by the yield of an unidentified furfural-yielding substance soluble in 70 per cent alcohol. This material was found in decreasing amounts as the protopectin content decreased in the ripening process. The author suggests that this furfural-yielding substance is a component part of protopectin and is liberated by the splitting during the natural ripening process. Evidence was secured that certain metabolic changes occur in the pectic constituents during ripening.

Maintaining the productivity of cherry trees, V. R. GARDNER (*Michigan Sta. Spec. Bul. 195 (1930), pp. 27, figs. 11*).—Supported by data on fruit bud, fruit spur, and lateral shoot production on different length shoots, on the fruiting performance and growth under different systems of culture and pruning, and on growth response to fertilizers, the author presents a comprehensive discussion on the growth and fruiting habits of the sour cherry from the time of planting to full production.

The vigorously growing young sour cherry tree forms fruit buds freely, mainly on spurs in some varieties and mainly through lateral fruit buds on shoots in others. In the Montmorency cherry, fruit is formed on both shoots and spurs, and, although this habit may be modified by pruning, yields are thereby reduced and such pruning is therefore undesirable. The general effect of pruning on the sour cherry was to reduce bearing area and yields, despite increasing the vigor of the remaining shoots and branches. Pruning weakened the fruit spurs. Diseases, such as leaf spot, which cause premature defoliation, result in shorter and weaker shoots and less productive spurs. Yields can be maintained by cultural practices which tend to produce shoots averaging 5 to 7 in. in length. Nitrogen fertilizers applied to healthy trees tended to promote shoot growth, enlarge the bearing area, and increase yields. Sod culture was not found desirable, as it tended to slow down growth.

Fruit-bud development in strawberry varieties and species, G. F. WALDO (*Jour. Agr. Research* [*U. S.*], *40 (1930), No. 5, pp. 393–407, figs. 12*).—Of a large number of strawberry varieties and species examined at the United States Plant Field Station, Glenn Dale, Md., only one, *Fragaria nilgerrensis*, native of northern India, failed to differentiate fruit buds in September and early October. This species did not develop buds until November and is considered potentially valuable for breeding new varieties with adaptability to a wider range of environments than is possessed by existing varieties. Indications of the onset of fruit bud differentiation were observed over a considerable period before actual differentiation could be established. Duration of the period of differentiation varied with varieties, and the rapidity and uniformity of subsequent development were also found to vary considerably. Although no absolute correlation was established between early differentiation of fruit buds and early blooming and ripening and conversely between late development and late blooming and ripening, these correlations did exist in many cases.

Fruit-bud formation in everbearing strawberries, G. F. WALDO (*Jour. Agr. Research* [*U. S.*], *40 (1930), No. 5, pp. 409–416, figs. 6*).—A companion paper to the above, in which it was found that in everbearing strawberries the fruit that ripens in May and early June apparently develops from fruit buds differentiated the preceding autumn, while that which ripens in July and later develops from buds differentiated during the same season. Instead of continuing runner production throughout the summer, everbearing varieties developed flowering stalks from the leaf axil or more often produced short branches the growing point of which differentiates a fruit bud. This process continues until checked by winter cold. A break in flower stalk production for three or four weeks following the spring crop and favorable environment are suggested as causes for the unusual activity of everbearing varieties in producing runners, new branches, and fruit buds at this season.

Respiration in strawberry fruits, A. R. GERHART (*Bot. Gaz., 89 (1930), No. 1, pp. 40–66, figs. 4*).—As determined at the University of Chicago with a highly sensitive respirometer, which is described in some detail, the maximum initial rate at which strawberries respire occurs at 36.5° C., but at high temperatures respiration rapidly declines. Up to 25° the respiration rate increased about 2.5 times for each 10° rise in temperature. A temporary rise in respiration rate occurred on exposure of berries to dry air, later falling to a point slightly below that of berries held in moist environment. Sound berries were highly resistant to water loss, losing only 2 per cent by weight after 50 hours' exposure in dry air, as compared to 1.1 per cent in moist air. The water content of berries was uniformly around 89.5 to 90 per cent. The respiratory ratio of ripe berries was found to be approximately 1.2. Varieties differed in their respiration rates. Acid content declined in strawberries from the green stage to full maturity. Ethylene in concentrations of 1 : 1,000, 1 : 1,500, and 1 : 2,000 had no apparent influence on ripening.

Rubus chamaemorus L.: A morphological, biological study, T. R. RESVOLL (*Nyt Mag. Naturv., 67 (1929), pp. 55–129, figs. 44*).—A general discussion, taking into consideration the widespread distribution of this species, associated plants, habits of growth and flowering, structure of the plant, flowers and fruit, and economic features.

Testing Phylloxera-resistant grape stocks in the vinifera regions of the United States, G. C. HUSMANN (*U. S. Dept. Agr., Tech. Bul. 146 (1930), pp. 54, pls. 10, figs. 2*).—Following a general discussion of the Phylloxera problem in California, supplementing earlier work (E. S. R., 33, p. 538), detailed notes are presented on the results of tests in twelve California localities of a large number of European and American hybrid grapes and American species considered of possible value as stocks in regions infested with Phylloxera. The more promising of the direct producers, that is, vines growing on their own roots, introduced from Europe, were lacking in desirable qualities either of Phylloxera resistance or fruit quality or both and were not equal to some of the finer American hybrids.

Cultural methods in the bearing vineyard, N. L. PARTRIDGE (*Michigan Sta. Circ. 130 (1930), pp. 19, figs. 9*).—A general discussion supported by experimental evidence.

The desirability of strong vine growth to the extent that it does not become overvegetative and is not prolonged too late in the season is stressed. The most practical measure of vine growth is the weight of young wood removed at pruning, 2.5 to 3.5 lbs. per vine per year being considered ideal for the Concord variety.

In respect to fertilizers, data presented on two vineyards, one on Fox sandy loam and the other on Plainfield loamy sand, show the benefit of nitrogenous materials, especially on the poorer soil. Phosphorus did not prove profitable in either vineyard, and potash was of doubtful value. Comparing nitrate of soda with ammonium sulfate in a vineyard on Plainfield soil, no significant differences were noted. Lime applied with the sulfate did not increase yields or growth and in fact appeared somewhat harmful. On a Fox sandy loam soil 200 lbs. of nitrate of soda per acre proved more profitable than did smaller or larger amounts.

Of cover crops, annual plants which kill out in winter are deemed best, and the time of sowing should be governed by soil moisture and condition of the vines.

As a desirable means of replacing missing plants, layering is suggested.

Rooting habits of citrus trees, D. D. Waynick and S. J. Walker (*Calif. Citrogr., 15 (1930), No. 5, pp. 201, 238, 239, figs. 2*).—Observations by means of glass-sided boxes placed in the soil upon the development of roots of grapefruit, lemon, and orange trees showed that in spring root growth starts in the subsoil nearly 28 days earlier than in the upper foot. Root growth preceded top growth except in the fall cycle when there was coincidence under certain conditions. Periods of active root growth were limited and were followed by rests of two or even three months even in spring and summer.

Determinations of soil temperatures at different depths showed that above a depth of 14 in. soil temperatures were consistently lower than those occurring from 14 to 18 in. until the middle of April. Average subsoil temperature at the time of the initiation of root growth in late March was 13.8° C. (56.9° F.), slightly above the essential minimum. Temperatures below 20 in. averaged 1.5° less than in the 14 to 18 in. zone. The authors point out that 90 per cent of the active rooting area for citrus trees occurs in the upper 22 in. of soil, and they discuss cultural practices in relation to this situation.

Inheritance of composition of Washington Navel oranges of various strains propagated as bud variants, E. M. Chace and C. G. Church (*U. S. Dept. Agr., Tech. Bul. 163 (1930), pp. 23*).—Comparable to an earlier investigation dealing with bud variants of the Eureka and Lisbon lemons (E. S. R., 51, p. 749), a study was made of the composition of 18 strains of the Washington Navel orange which differed markedly in certain physical characteristics. As a result of the study there were found certain distinctive differences existing in composition and which were transmitted from the parent to the progeny in the process of asexual reproduction. The differences were generally quantitative in amounts of peel, oil, insoluble solids, and acids, with less variation in respect to specific gravity of the fruit and in soluble solids and sugars of the juice. Distinctive differences were found between the Washington and Thomson strains. Data for the various strains are presented in detail, with comparisons between progeny and parents analyzed by the Student method.

Citrus culture in Porto Rico, H. C. Henricksen (*Porto Rico Sta. Bul. 33 (1930), pp. 34, figs. 16*).—General information is presented on the growing of citrus fruits, taking into consideration such items as soil preferences, stocks and propagation, use of windbreaks, methods of planting and culture, use of fertilizers, pest control, and methods of harvesting.

Abnormalities in pecans.—I, Abnormalities in pecan flowers, J. G. and N. C. Woodroof (*Jour. Heredity, 21 (1930), No. 1, pp. 39–44, figs. 5*).—Genetic instability in the flowering habit of the pecan is suggested as the result of discovering at the Georgia Experiment Station various flower abnormalities. The pecan normally bearing catkins laterally on last year's wood and pistillate blooms terminally on current wood was found in rare instances to produce both catkins and pistillate flowers on a single axis on current season's growth. The pistillate blooms of these odd forms were found capable of developing into nuts, and the pollen of the staminate blooms showed over 60 per cent of normal-appearing grains. Attempts to induce this condition in normal varieties by heavy feeding of the soil were unsuccessful. A second "perfect" form was found which differed from the first in that the staminate blooms were borne at the base rather than at the terminus of the flower cluster. Other abnormalities include those with normal flowering habit but possessing an excessive or subnormal number of catkins. In concluding, the authors point out that none of these phenomena are of economic importance because of their rarity.

Abnormalities in pecans.—II, Abnormalities in pecan nuts, J. G. Woodroof (*Jour. Heredity, 21 (1930), No. 2, pp. 91–96, figs. 5*).—Following the paper noted above, this discusses variation in fruiting. Although the pecan is normally dicotyledonous, nuts were found with embryos containing one and three cotyledons. The shell of the pecan normally has two sutures, yet variants were found with three. Twinning occurred in certain varieties, notably Curtis, and is considered an objectionable character because of the resulting deformation of the embryo and shell.

Carnation culture, W. W. Wiggin (*Ohio Sta. Bul. 449 (1930), pp. 28, figs. 7*).—Interpolated with the results of miscellaneous tests, a general discussion is presented upon propagation, soils, fertilizers, methods of planting, varieties, etc. In a test with the Mrs. C. W. Ward carnation, January propagation proved better than March. Trimming of cuttings was not found advisable. Various propagating media proved satisfactory when other requirements were met. Checking of the growth of cuttings at any stage was undesirable. Little difference was found between field- and pot-grown plants if both were handled properly. An open, porous soil containing abundant organic material proved desirable, and on raised benches it was found that the soil should be changed annually. Nitrogen, phosphorus, and humus were apparently the chief limiting soil ingredients, but the keeping quality of blooms was not materially affected by fertilizers within reasonable limits. Close planting, depending somewhat on varietal habits of growth, was desirable. Supports were useful in securing straight stems and facilitating culture. Descriptions of the more important varieties are presented and show material differences in production, keeping quality, strength of stem, disease resistance, etc. No correlation was established between stem length and size of blooms.

FORESTRY

Survival and early growth of planted southern pine in southeastern Louisiana, R. W. Hayes and P. C. Wakeley (*La. State Univ. Bul., n. ser., 21 (1929), No. 3, II, pp. 48, pl. 1, figs. 9*).—Observations in the Bogalusa plantations in southeastern Louisiana, where various plantings of slash, loblolly, and longleaf pines have been made in recent years, showed the best survival of slash pine on the flats and the poorest on the ridges. Longleaf pine showed better survival on the ridges than did slash pine, and under favorable conditions survived better than did any other species planted. Slash pine seedlings three years in the field and four years from seed averaged as much as 39.6 in. in height. Loblolly pine under favorable conditions survived better than slash pine and made equally good growth. Planting one-year nursery stock generally gave better results than did direct seeding. Rabbits caused serious injury to slash and loblolly pines but did not molest the longleaf species.

The anatomy of Euphorbia intisy, C. F. Swingle (*Jour. Agr. Research [U. S.], 40 (1930), No. 7, pp. 615–625, figs. 7*).—A report on the results of a cytological study of *E. intisy*, a rubber-producing plant collected by the author in southern Madagascar and introduced by him into the United States for trial. The stem structure is characterized by early lignification, delayed phellogen formation, and the presence of very long, ramified latex cells. In respect to the structure of the root system, in addition to absorbing roots, which display six primary bundles, pericyclic cork, and other characteristics common to members of the genus Euphorbia, all of the main roots show alternate series of ordinarily thickened root segments and greatly swollen water storage segments, designated by the author as hydriarhizas. These enable the plant to withstand extremely arid conditions, such as characterize southern Madagascar.

Trees for Wyoming farmers and ranchmen (*Wyoming Sta. Circ. 23 (1930), pp. 3*).—This supersedes Circular 22, previously noted (E. S. R., 62, p. 532).

Glossary of terms used in fire control (*U. S. Dept. Agr., Misc. Pub. 70* (*1930*), *pp. II+22*).—A presentation of definitions alphabetically arranged.

DISEASES OF PLANTS

[Plant pathology at the Georgia Station] (*Georgia Sta. Rpt. 1929, pp. 16–20, 22*).—Following studies noted on page 144, in which the life history and the development of the fungus, *Mycosphaerella personata* n. sp., was discussed, work was carried out with *Cercospora personata*, which causes a serious leaf spot of peanuts. Although the fungus was found to be abundant in many cases on the hulls of peanuts, the removal of the hull and disinfection with mercuric chloride did not prevent infection of the young plants grown in isolation. Apparently the spores are carried long distances by the wind.

Breeding and selection of tomatoes for resistance to Fusarium wilt was continued and gave some promising results, including one practically immune selection.

Attempts to transfer peach rosette by inoculation with organisms isolated from diseased branches gave negative results, though insufficient time had elapsed to make the results certain.

Of several treatments tested for the control of Sclerotium blight of the pepper, a proprietary mercury compound gave the best results, though a few plants were apparently injured by this disinfectant. Some evidence was obtained that it gave some control of nematodes. A fruit rot of the pepper caused by an unidentified species of Colletotrichum was noted.

Studies with various cotton diseases showed no value in treating seed to combat the root disease caused by *F. moniliforme*. However, some increased germination was noted on the plants, the seeds of which were disinfected with certain mercury compounds. Cotton planted in brick-walled beds responded more favorably to seed treatment, the yield of seed cotton being much larger on the treated plats.

Halo blight (*Bacterium medicaginis phaseolicola*) of beans was found to the extent of 100 per cent infection on the Bountiful variety, very severe on Wardwell Kidney Wax and Stringless Green Pod, and only slight on Refugee, Extra Early Valentine, and Black Valentine. Studies showed the disease to be identical with that known as halo spot on kudzu.

No resting spores of downy mildew of cucurbits were found, it being apparent that the disease is brought north each spring by the winds. Of various sprays and dusts tested, Bordeaux mixture 3–4–50 gave the best control but delayed the ripening of cantaloupes, yet the fruit had more sugar than that produced on the check plats. Copper acetate gave very good results despite the lack of adhesion and is being further studied with a view to improvement in this respect. Copper-lime dust gave only slight disease control.

[Plant pathology at the Guam Station], C. W. EDWARDS and J. GUERRERO (*Guam Sta. Rpt. 1928, pp. 3, 4, 19, 22, 23*).—Scraping the infected area and applying Bordeaux paste to the wound proved the most effective of the remedies tried for scaly bark and gummosis of citrus. Applications of the paste to the bark of healthy trees apparently aided in preventing the diseases.

Attempts to control mildew on muskmelons by treatment with potassium sulfide, lime sulfur, and Bordeaux mixture were unsuccessful.

Mycological notes, V–X (*Trop. Agr.* [*Ceylon*], *69* (*1927*), *Nos. 1, pp. 7, 8, 9–12; 3, pp. 147–150, pl. 1; 4, pp. 202, 203; 70* (*1928*), *No. 2 pp. 77–79, pls. 2, pp. 80–84, pl. 1*).—This is a continuation in serial form, partly by others, of the reports formerly made by Small (E. S. R., 59, p. 636).

V. *On the occurrence on coconut of Rhizoctonia bataticola (Taub.) Butler*, M. Park.—These notes, preliminary in their nature, announce the discovery of *R. bataticola* in association with a root disease of coconuts and advocate removal of dead materials, fallowing, and aeration of the soil.

VI. *Further notes on Rhizoctonia bataticola (Taub.) Butler*, W. Small.—New hosts of *R. bataticola* are recorded, and points in connection with occurrences of this fungus on other plants are set forth.

VII. *Oïdium leaf disease of Hevea*, M. Park.—It is concluded that since the primary attack of Oïdium leaf disease is not directly and easily controllable under field conditions, indirect control should be attempted by cultivation and the application of quick-acting nitrogenous manures about wintering time; by resting badly affected trees; and by spraying with Bordeaux mixture to control secondary attack just when the leaves are attaining maturity, which treatment will also serve to control leaf and pod disease due to *Phytophthora faberi.*

VIII. *Further occurrences of Rhizoctonia bataticola (Taub.) Butler*, W. Small.—These notes indicate a few additional Ceylon plants showing *R. bataticola* in association with root disease.

IX. *Macrophomina phaseoli (Maubl.) Ashby, the pycnidial stage of Rhizoctonia bataticola (Taub.) Butler*, J. C. Haigh.—Referring to Small's record, noted above, of the occurrence in *Phaseolus vulgaris* of a stem blight due to *Macrophoma phaseoli*, recently renamed *Macrophomina phaseoli*, the present author suggests the presence among the jungle flora of *M. phaseoli*, for which a search was planned.

X. *A die-back of tea seedlings*, L. S. Bertus.—In 1927, it was reported that on an estate in the Kalutara district tea plants, apparently healthy as to roots and stems, showed on a few leaves patches superficially resembling those of brown blight. These plants revealed on close examination hyphae, forming a weft of mycelium at the leaf axils and on lower-leaf surfaces, probably belonging to a strain of *R. solani*. Inoculation tests with various plants are outlined, as are also remedial measures, which include destruction of infectious material and spraying the plants with Bordeaux mixture.

Water soluble arsenic in spray material, H. C. Young (*Ohio Sta. Bul. 448 (1930), pp. 22, figs. 6*).—Pointing out that fruit and foliage injury from spray materials results in serious losses, a study was made of various mixtures, various correctives, and other factors possibly involved. In general, it was found that mixtures of lime sulfur and lead arsenate in summer spraying strength contain a dangerous amount of water-soluble arsenic, and that the more dilute the lime sulfur is up to at least 1–100, the greater the amount of water-soluble arsenic.

Of various correctives tested for reducing the amount of water-soluble arsenic, freshly made high calcium hydrated lime was most effective. Hydrated limes high in magnesium were ineffective, even when 5 lbs. were added to 50 gal. of the spray mixture. Carbonate of lime, calcium caseinate, and various iron, aluminum, barium, and zinc compounds proved valueless as correctives. Manganar (manganese arsenate) did not react with lime sulfur to form water-soluble arsenic, and the addition of correctives had little effect on Manganar mixtures.

The wettable sulfur sprays reacted only slightly with lead arsenate and Manganar. Temperature, period of drying, type of water used, nature of the corrective agent, and many other factors regulated the production of water-soluble arsenic in lime sulfur-lead arsenate mixture, and this accounts, in part at least, for the spasmodic occurrence of spray injury.

Morphology and life history of some Ascomycetes, with special reference to the presence and function of spermatia, II, B. B. Higgins (*Amer.*

Jour. Bot., 16 (1929), No. 5, pp. 287–296, pl. 1, fig. 1).—In the present article, the second of this series (E. S. R., 46, p. 722), an account is given of the fungus generally referred to as *Cercospora viticola*, said to be a very common parasite in this conidial stage on living leaves of grapevines throughout the temperate and tropical regions of the world, and to cause serious defoliation in some warm or hot regions, especially during wet summers. The development of the fungus and of the spots on grape leaves has been studied and is here dealt with as regards natural infections and artificial inoculations with both conidia and ascospores. The results outlined are considered to justify the conclusion that the ascigerous stage of *C. viticola* has not been previously described. This form is, therefore, technically described in the ascospore stage and named as the new species *Mycosphaerella personata*.

Repetitional diplanetism in the genus Phytophthora, C. DRECHSLER (*Jour. Agr. Research [U. S.], 40 (1930), No. 6, pp. 557–573, fig. 1*).—In many species of Phytophthora encysted zoospores produced a second swimming stage without the interposition of a vegetative phase. Two distinct courses of development were observed, involving the production of a papilla or tube of dehiscence on the one hand and a slender and more often rather long germ sporangiophore on the other.

When dehiscence of the ordinary sporangia is partly or wholly frustrated, the imprisoned zoospores after encystment often give rise to a free-swimming stage through repetitional development.

The phenomenon of diplanetism was also observed in various species of Pythium and, as in Phytophthora, followed the course generally characteristic of zoospore formation in the genus.

Differential injuries to winter wheat and winter rye varieties by Fusarium nivale and its effects on grain yields [trans. title], M. I. SALTYKOVSKIĬ (M. J. SALTYKOWSKY) (*Zhur. Opytn. Agron. I͡ugo-Vostoka (Jour. Expt. Landw. Südost. Eur.-Russlands), 5 (1928), No. 2, pp. 346–359, pl. 1; Ger. abs., p. 359*).—During the course of an epidemic development of *F. nivale*, all varieties of winter wheat and winter rye studied suffered loss. Artificial snow conditions, early sowing, and thick seeding resulted in severe development of *F. nivale*. Slight depressions and furrowings were significantly correlated with increased injury percentage. Adequate attention to the quality of resistance in seed was considered as essential.

A cytological study of heterothallism in Puccinia graminis, R. F. ALLEN (*Jour. Agr. Research [U. S.], 40 (1930), No. 7, pp. 585–614, pls. 17*).—A detailed report is presented on the results of a cytological study, in which the author traced the history of heterothallism of *P. graminis* as it occurs in the barberry host.

It was observed that in *P. graminis* the sporophyte generation does not start in the aecium, nor probably in the mycelium, but rather in the pycnium, and that pycnospores from another infection are necessary for its inception.

In isolated unisexual infections the pycnia continue to produce pycnospores as long as the fungus lives, while in infections where fertilization has occurred the whole pycnium soon dies. The possibility of new forms of the rust arising from the hybridization of different physiological forms is discussed, with the comment that no positive evidence has yet been presented of more than two sexual groups in *P. graminis*. Commenting on the possible occurrence of homothallism in *P. graminis*, the author asserts that a few cases of irregular and often abortive development in old haploid aecia have been noted and may be homothallic in character.

Effect of leaf rust (Puccinia triticina Eriks.) on yield of wheat, E. B. MAINS (*Jour. Agr. Research [U. S.], 40 (1930), No. 5, pp. 417–446, figs. 6*).—

Leaf rust, prevalent in the soft winter wheat area of the United States, causes marked reduction in yield by reducing the number and weight of the kernels. The effect of the leaf rust varied with the severity of the infection and the stage of development of the plants on attack.

Plants of the Mediterranean and Red Fern varieties moderately infected from tillering to maturity suffered 63.3 and 57.2 per cent yield reduction, respectively. The effect of the time of infection was shown in Fulcaster wheat. When heavily infected from tillering to maturity the yield was only 2.6 per cent, when heavily rusted when the heads first showed in the boot 45.7 per cent, and when rusted in the period from blossoming to maturity 75.3 per cent of a crop. The leaves of rusted plants died prematurely, and the weight of the straw was decreased according to the duration of the infection.

Dusting with sulfur greatly reduced leaf rust in field plats and resulted in larger yields than on undusted areas. That severe infection of a highly resistant variety may cause a decided reduction in yield was shown in the Webster wheat, and leads to the suggestion that tests of resistant wheats planted adjacent to susceptible varieties do not give a fair indication of the yielding capacity. Severe autumnal infection of winter wheat is considered a likely cause of winterkilling.

A mosaic of wheat transmissible to all cereal species in the tribe Hordeae, H. H. McKinney (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 6, pp. 547–556, figs. 3*).—Mosaic was produced in *Triticum vulgare*, *T. compactum*, *T. turgidum*, *T. durum*, *T. dicoccum*, *T. spelta*, *T. polonicum*, *T. monococcum*, *Hordeum sativum*, and *Secale cereale* grown in virus-infested soil obtained from locations in Illinois and Indiana where wheat mosaic was known to exist. Evidence was obtained that all susceptible species contained resistant strains. Mosaic developed appreciably in the spring types of wheat only when these were sown in the fall and carried through the winter with the aid of mulching. Typical mosaic rosette occurred only among a limited number of varieties of winter common wheat, certain strains being selected which developed 100 per cent of mosaic rosette.

Green and yellow types of mottling and yellow streaking or striping were observed on the plants under study, leading to the suggestion that several distinct viruses may cause mosaic and other disorders in the small grains. It is thought possible that some of the yellow and green mosaics of wheat are associated, and also that genetic factors within the plant may influence the symptoms produced by any given virus. Rosette was always found associated with mosaic and is deemed simply a phase of the disease.

Leaf spot and foot rot of Kentucky bluegrass caused by Helminthosporium vagans, C. Drechsler (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 5, pp. 447–456, figs. 5*).—Noting a considerable amount of injury to bluegrass growing under the unnatural conditions of the closely clipped golf course from the ravages of *H. vagans*, generally considered an innocuous parasite, a study was made of the parasite and its effect on the bluegrass plants. The serious injury observed on the golf course is believed to be the result of a weakened condition in the plant itself brought about by an excessive reduction of the functional leaves. The delicate growth of the closely clipped grass results in a condition in which the upper axial part consists chiefly of imbricated leaf sheaths of such small proportions as to be subject to foot-rot lesions. The practical remedy suggested is that of cutting less frequently. Efforts to discover an ascigerous stage in the withered remains of the preceding year's growth were not successful, though from its resemblance to other species which have an ascigerous phase there was reason to suspect the existence of such.

Fruit-rot disease of cultivated Cucurbitaceae caused by Pythium aphanidermatum (Eds.) Fitz., M. Mitra and L. S. Subramaniam (*India Dept. Agr. Mem., Bot. Ser., 15 (1928), No. 3, pp. 79–84, pls. 3*).—For some years, during the monsoon period, a fruit rot disease described as affecting useful cucurbits has caused much loss both in the field and in storage. The fungus, which is in every case referred to as *P. aphanidermatum*, has been isolated from *Luffa acutangula*, *L. aegyptiaca*, *Trichosanthes anguina*, *T. dioica*, *Cucumis sativus*, *Lagenaria vulgaris*, *Momordica charantia*, and *C. melo momordica*. It is claimed that *P. butleri* is a strain of *P. aphanidermatum*, which is more prominent on fruits than on leaves and stems, forming a luxuriant woolly weft of mycelium. The formation of sporangia is like that of Pythium, belonging in the *gracile* group. The fungus, which grows well in culture, especially meal agars, forms freely oogonia and oospores. Sporangia and zoospores form copiously in water culture or on boiled ants in six hours but not on any solid medium.

Seed treatment for the control of seed-borne diseases of melon, cucumber, and squash, F. Van Haltern (*Georgia Sta. Circ. 88 (1930), pp. 8*).—Of various seed disinfectants tested for the control of seed-borne diseases of cucurbits, two proprietary materials, ethyl mercury chloride dusts, were found most satisfactory. A 5-minute immersion in a 1–1,000 mercuric chloride solution often caused serious injury to the seed, and formaldehyde solutions in adequate strengths were also injurious. Formaldehyde gas treatment was not found practical. Methods for using the two successful dusts are discussed.

√ **The inheritance of Fusarium wilt resistance in canning peas,** B. L. Wade (*Wisconsin Sta. Research Bul. 97 (1929), pp. 32, pls. 4, fig. 1*).—Observing that certain varieties of canning peas are highly resistant to the wilt organism *F. orthoceras pisi* and others very susceptible, studies were made of the inheritance of resistance in various crosses between resistant and susceptible varieties, between resistant and resistant varieties, and between susceptible and susceptible varieties. The general conclusion is reached that resistance in this case is due to a single dominant factor, and linkage studies showed no relation between resistance and sugar but did show a loose linkage of about 31 per cent between resistance and tallness.

A rate of wilting test showed in a Horsford × Resistant Alaska cross that the shorter type of peas wilted at a slightly more rapid initial rate than did tall segregates, a situation believed due to modifying factors or to the modifying effect of the gene for tallness itself.

In general conclusion the belief is stated that resistance to the Fusarium under study can be readily combined with desirable varietal characteristics and lead to the development of new strains combining resistance with high quality.

The causes of degeneration of Irish potatoes in Connecticut, B. A. Brown (*Connecticut Storrs Sta. Bul. 160 (1929), pp. 325–380, figs. 8*).—Observing that locally grown potato seed stocks were inferior to those obtained from points further north, various studies were conducted during the period 1914–1921 to determine the ways and means of growing vigorous stock but without avail. These trials included mulching with hay or straw, planting late, the use of immature seed, hill selection, and growing in different localities within the State. Of these only the use of immature seed gave somewhat better yields.

Beginning in 1922, studies of the effects of virus diseases were featured, and they showed conclusively that mosaic, leaf roll, spindle tuber, and similar diseases are the chief causes of degeneracy of potatoes in Connecticut. When these diseases were controlled by isolation, either in cheesecloth cages or by planting 1,000 ft. or more from other potatoes, satisfactory seed stock was produced. Somewhat better results were secured in the cheesecloth cages than by simple isolation. Green Mountain proved more susceptible to virus diseases than did Irish Cobbler or Russet Rural. Some indication was noted of the existence of strains differing in resistance within a variety.

A rather exhaustive review of the literature is included.

Seed treatments for scab and Rhizoctonia on potatoes (*Connecticut Storrs Sta. Bul. 162* (*1929*), *p. 5*).—According to this note, mercuric chloride and hot formalin produced crops with the least scab. Mercuric chloride gave the best control of Rhizoctonia.

Soil and cane composition in relation to Lahaina failure at Waipio Substation, F. Hansson (*Assoc. Hawaii. Sugar Technol. Rpts., 6* (*1927*), *pp. 33–37*).—It has been shown that many factors are causally active in the so-called Lahaina disease, or failure of root development in the cane of that name. Chemical influences supposedly associated with growth failure are (1) high salt concentrations in the soil solution, (2) soluble salts of iron and aluminum in the upland acid soils, and (3) lack of availability in one or more of the major plant foods. But Lahaina failed in some cases where soil conditions were to all appearances normal, and in order to obtain information regarding this failure in good soils, experimental plats were planted at the Waipio Substation, the results from which are tabulated and discussed.

It is claimed that the failure of Lahaina at Waipio is not associated with an injurious salt content in the soil, harmful acidity, or a shortage of the major nutrients. Studies of the composition of the poor Lahaina cane from Waipio contrasted with good Lahaina from Maui showed a lower percentage of potash, a higher content of silica, and a higher magnesium-lime ratio in the Waipio canes. Spectroscopic examinations of the ash of poor Lahaina cane from Waipio compared with the ash of the cane from Maui showed the presence of boron and lead in practically all of the latter and in but few cases of canes from the former station.

The effect of these rarer elements is being tested at Waipio, as no conclusions appear safe at this time regarding the definite function of these rarer elements in plant nutrition.

Progress report of the Pythium root rot phase of the Lahaina growth failure problem, H. A. Lee, C. C. Barnum, D. M. Weller, and C. W. Carpenter (*Assoc. Hawaii. Sugar Technol. Rpts., 6* (*1927*), *pp. 4–10, fig. 1*).—Further study applied to the trouble formerly designated as Lahaina disease, but last reported on (E. S. R., 57, p. 152) as a growth failure complex due to various factors, such as aluminum and ferrous-iron toxicity in the soil, high concentration of salts in the soil, nematodes (*Heterodera* and *Tylenchus* spp.) attacking the cane roots, and root fungus rots, has developed during the intervening year two new factors, namely, the effect of replaceable bases, varying soil permeability, and that of an insect (Isotomodes) working on the cane roots.

The Pythium, reported as capable of causing much harm on Hawaii, and known to be present also on Maui, Oahu, and Kauai, is referred to as occurring on sugarcane in Porto Rico and Louisiana, and probably on corn in the central part of the United States, likewise on tobacco, papaya, and other hosts in India. It is suspected that this root-rotting Pythium is somewhat generally distributed in cane-raising countries. It is stated that, judging from the history of the Lahaina or Otaheite variety in other sugar countries, this cane has failed elsewhere much the same as it has in Hawaii since 1896. In addition to Lahaina, other varieties found to be severely affected on the islands are H 146, H 20–S–20, and Porto Rico Uba. The Java variety EK 28 is susceptible to root rot, the identity of which has not yet been ascertained.

At the Waipio Substation it was shown experimentally that potash and phosphoric acid as fertilizer constituents had no very appreciable effect on Pythium root rot of sugarcane. Sulfur applications, used in the same experiment with a view to remedy the alkalinity of the soil, have now begun to show a considerably lower pH reaction.

A promising method of alleviating the Pythium root rot is that of increasing drainage and root aeration. The addition of organic matter is also considered promising, and experimentation is to be further elaborated along the lines of chemical control of Pythium root rot through the use of copper sulfate, soluble sulfur, and other compounds.

Progress report on root rot investigations, C. C. Barnum (*Assoc. Hawaii. Sugar Technol. Rpts., 6 (1927), pp. 37–40*).—This study of Lahaina cane was featured by the effects on growth of admixture with soil of decomposed mud press, in which a fungus resembling *Verticillium* sp. was found in the flaccid root tips; an unsuccessful attempt to isolate a Chytridium from H 146 canes grown in Waipio soil, in which *Pythium* sp. was found to predominate in the diseased root tips; root studies on Lahaina cane at the Makiki Station, vitiated by natural infection, species of Verticillium, Fusarium, Rhizoctonia, and Pythium occurring in order of decrease as named; and studies on Lahaina cane grown at Waipio Substation, the root systems of which were killed by fungus root rot, favored by soil conditions. Sulfur appears to have a favorable effect on Lahaina cane in the presence of Pythium infecting the usually alkaline soil.

Report of conference on tobacco diseases and nutrition problems, 1929 (*U. S. Dept. Agr., Ext. Serv., [1929], pp. [57], pls. 12*).—A mimeographed report of the conference held in Washington, D. C., December 10 to 12, 1929. The main discussions deal with the general situation, seed bed sanitation, influence of fertilizers and green manures, and field sanitation and care of plants in the field. The status of the disease and nutritional problems in tobacco growing States is summarized in appended accounts from the several experiment stations. Outline maps show the current distribution of tobacco diseases.

Side rot of pineapple plants, C. P. Sideris (*Pineapple Technol. Soc., Pineapple Men's Conf. Proc., 6 (1927), pp. 74–81*).—This pineapple disease is said to have been misnamed, as there is no rot until secondary organisms enter the plant. The terms "side bending" and "plagioclisis" are suggested as more appropriate. The trouble caused considerable damage in Hawaii in 1925–26 and 1926–27, the death rate ranging in some cases from 1 to 10 per cent. Continued growth of the tissue on the side not attacked causes a somewhat characteristic distortion. Infection usually occurs in the soft tissue at the base of a young leaf.

Of the organisms isolated, *Fusarium trichothecioides* is named. Conditions thought to be favorable include tissues of soft consistency, winter weather, and severe windstorms. Wounding, occurring in different ways, appears to favor the attack. Planting material should be treated with some efficient fungicide once before being used and once each two months thereafter for ten months, after which application of fertilizers may be made.

The relationship of various factors to pineapple wilt, C. P. Sideris (*Pineapple Technol. Soc., Pineapple Men's Conf. Proc., 6 (1927), pp. 206–213*).—The author has found that the unhealthy condition of pineapples known as wilt may be due to the effects of one or more factors, one of those studied being the hydrogen-ion concentration of the solution in contact with the roots. Other factors studied are soil fertility, soil moisture, and soil microorganisms. The effects of these are detailed.

Marbled fruit disease of pineapples, C. P. Sideris (*Pineapple Technol. Soc., Pineapple Men's Conf. Proc., 6 (1927), pp. 233–238, fig. 1*).—The "marbled" condition of pineapples which has supposedly existed in Hawaii for some years is thought to be due to a short rod-like bacterium similar to that said to be isolated from cases of so-called black rot in Haiti.

First report on pests and diseases of tea in Nyasaland, C. Smee (*Nyasaland Dept. Agr., Ent. Ser. Bul. 1 (1927), pp.* [6]*; abs. in Tea Quart.* [*Tea Research Inst. Ceylon*], *1 (1928), No. 3, pp. 80, 81*).—In this form has been separately published the section dealing with pests and diseases of tea of the entomological report for 1926, which has been noted (E. S. R., 61, p. 657).

In this bulletin (which also deals with insects) separate accounts are given of tea diseases affecting leaf, stem, and root. The first include brown blight (*Colletotrichum* sp.) and gray blight (*Pestalozzia* sp.); fungi similar to copper blight (*Guignardia* sp.), marginal corrosion (*Colletotrichum* sp. and *Pestalozzia* sp. together), and rim blight (*Cladosporium* sp.), as well as types comparable with Mycosphaerella and Cercosporella; a common spotting due to a fungus of the Phoma type, possibly traceable as a consequent of mosquito bug injury; scabbed leaves (no cause traced); scaly upper surface to midribs; copper-colored sheen between the leaf veins; and blister-like swellings on the upper leaf surface (cause doubtful but Colletotrichum, Mycosphaerella, and Cercospora found). Stem diseases include the very important die-back (*Macrophoma theae*, later Desmotascus, Septoria, and other fungi), also *Nectria* sp. and *Stilbum* sp. (possibly saprophytic). Root diseases include stump rots (Armillaria), destroying older bushes (some young plants also dying, perhaps from brown root disease), and Botryodiplodia root disease, the most important and difficult disease in Nyasaland. A relation between this trouble and the Macrophoma stem or shoot die-back is suspected.

Blister blight in India, T. Petch (*Tea Quart.* [*Tea Research Inst. Ceylon*], *1 (1928), No. 3, pp. 75, 76*).—The author notes the distribution, as partly indicated by Tunstall (E. S. R., 60, p. 354), of tea blight in parts of India, its presence and history elsewhere as previously in part recorded by himself (E. S. R., 53, p. 49), and factors influencing the spread and prevalence of this disease.

Fomes lignosus, T. Petch (*Tea Quart.* [*Tea Research Inst. Ceylon*], *1 (1928), No. 3, pp. 64–66*).—The author notes and answers comment cited regarding statements said to be contained in his book, previously noted (E. S. R., 47, p. 755).

It is asserted that *F. lignosus* is a synonym of *Polyporus microporus* and should be discarded, that the fungus known as *F. lignosus* in the West Indies should be designated as *P. microporus*, that the correct name of the fungus called *F. lignosus* in the East Indies is not known, and that any attempt to correlate the diseases of one country with those of another must depend upon the correct identification of the causal fungi.

The parasitism of Rosellinia arcuata, C. H. Gadd (*Tea Quart.* [*Tea Research Inst. Ceylon*], *1 (1928), No. 3, pp. 55–60, pls. 2*).—In view of the statement which has been made that *R. arcuata* on tea plants is nonparasitic, and that it is harmless without a preliminary attack by *Rhizoctonia bataticola*, claimed to be the only parasite of present importance in the causation of tea root disease, the author carried out three experiments, which are described. It is claimed that the results of infection with *Rosellinia arcuata* show that this fungus, not aided or preceded by *Rhizoctonia bataticola*, is a virulent parasite of the tea plant.

Proposed variations in soil preparation for nematode control, G. H. Godfrey (*Pineapple Technol. Soc., Pineapple Men's Conf. Proc., 6 (1927), pp. 81–86, fig. 1*).—Approving standard practice, the speaker presented propositions for nematode control, including fallow, rotation, trap crops, and poison.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Check list of publications on entomology issued by the United States Department of Agriculture through 1927, with subject index, compiled by M. Colcord, I. L. Hawes, and A. J. Carabelli (*U. S. Dept. Agr., Library, Bibliog. Contrib. 20 (1930), pp. IV+261*).—This is a compilation of publications on entomology issued by the U. S. Department of Agriculture, arranged in four parts, namely: (1) The general series of the Department; (2) the publications of the Bureau of Entomology; (3) the publications relating to entomology of other bureaus, divisions, and offices of the Department; and (4) the subject index.

A bioclimatic zonation for studying the economic distribution of injurious insects, W. C. Cook (*Ecology, 10 (1929), No. 3, pp. 282–293, figs. 3*).—In this contribution from the Montana Experiment Station it is pointed out that in certain regions the insect is well adapted to the normal climate and would cause outbreaks every year if it were not controlled by variations from the normal climate. Climatic extremes which would wipe out the population are either absent or very rare and local, and in this zone the insect is controlled largely by its insect parasites.

"In regions adjacent to the normal zone the insect is not adapted to the normal climate, but to variations from the normal, and outbreaks follow these variations. Severe extremes, which almost wipe out the population, occur at frequent intervals, but a permanent population is maintained which can serve as the nucleus for an outbreak when conditions become favorable. In this zone parasites are of less importance, and outbreaks are frequently checked by fungus and bacterial diseases. This may be called a zone of occasional outbreaks. In regions still farther removed from normal conditions for the insect a permanent population is not maintained, but outbreaks caused by migrants may follow outbreaks in the inner zones. These outbreaks are controlled directly by climatic extremes, or indirectly by fungus and bacterial diseases. This outer zone may be termed a zone of possible outbreaks. In the outer zones parasites may be of importance, but they must be forms having other hosts which are adapted to the climate of these regions. The specific parasites of the insect will rarely or never follow it to the extreme of distribution.

"These three zones are definitely correlated with climatic conditions, and, if the critical climatic conditions are known, it will be possible to set definite criteria for their limits, based upon probability of occurrence of favorable or unfavorable conditions. This has been done for the pale western cutworm in another study, part of which is presented in abstract."

[Notes on economic insects and control measures] (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 984–986*).—Brief accounts here presented are as follows: Further Results with the McIndoo Insect Olfactometer [E. S. R., 55, p. 552], by O. I. Snapp and H. S. Swingle (p. 984) (E. S. R., 61, p. 248); Codling Moth Larvae Parasitized by *Secodella acrobasis* Crawford, by C. Wakeland (p. 985); The Spread of *Samia cecropia* (p. 985) and Eupelmus from Rose Galls (pp. 985, 986), both by T. D. A. Cockerell; and *Rhynchophorus cruentatus* Fab., the Palmetto Weevil, Attracted to Automobile Paint, by C. O. Bare (p. 986).

Studies on the insect fauna of Iowa prairies, G. O. Hendrickson (*Iowa State Col. Jour. Sci., 4 (1930), No. 2, pp. 49–179, pls. 2*).—This account consists in large part of an annotated list, arranged by orders, of the insects occurring on Iowa prairies. Twenty-six references to the literature cited are appended.

Some aspects of the evolution of species among the native insects of Hawaii, O. H. Swezey (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 851–857*).—This is a contribution from the Sugar Planters' Experiment Station, Honolulu, Hawaii.

Report of the entomologist, S. R. Vandenberg (*Guam Sta. Rpt. 1928, pp. 23–31*).—The first part of this report deals with the sugarcane beetle borer *Rhabdocnemis obscura*, which is generally present in the cane fields of Guam and does serious damage when the cane reaches commercial size. The borer was also found to attack the bud tissue of the coconut palm to a limited extent and has been found recently established in the bole or lower portion of the trunk, where it produces symptoms similar to those of the so-called "bleeding disease." The burrows do not penetrate into the wood beyond 1.5 in., and no borers were found above 4 ft. from the ground where the wood is very hard and dry. Below 4 ft., however, there is apparently enough dormant root tissue and moisture to provide the necessary succulence for its development. While the damage done is not severe, it is shown that this borer may exist under a wide range of conditions and is a factor that must be reckoned with if sugarcane is to be grown on a commercial scale in Guam in the future. Its life history varies widely, and the pest may be found in all stages at any time during the year. In sugarcane the life cycle from egg to adult occupies from 60 to 80 days or longer, the egg stage being fairly constant at from 4 to 6 days, the larval stage from 50 to 60 days, and the pupal stage from 10 to 15 days.

The tachinid fly *Ceromasia sphenophori*, which holds the sugarcane pest in check wherever introduced successfully, was first introduced into Guam from Hawaii by the station in 1926, but failed to become established and was again introduced from Hawaii with success in the summer of 1927, the details of the introductory work being described. Observations showed that from 34 to 35 days are required for the completion of its development from egg to adult, and from 36 to 37 days for its life cycle.

In November the corn borer parasite *Exeristes roborator* to the number of 1,113 was introduced from the United States. The life cycle of this parasite under insectary conditions, while variable under optimum conditions of food and temperature, was found to be as follows: Egg stage 1 day, larval stage 7 days (feeding 4 days, spinning 1 day, and resting 2 days), pupal stage 7 days, and postpupal stage 1 day. The emerging females are ready to begin egg laying by the third day, so that the entire life cycle may be carried through in 18 or 19 days.

The house fly parasite *Spalangia* sp., introduced from Hawaii in November, now is fairly well established around the sheds, barn, and manure dump of the station.

The miscellaneous notes included relate to the coconut scale (*Aspidiotus destructor*), which, due to an attack of the small black ladybird beetle *Cryptogonus nigripennis*, continues under complete control, and the chrysomelid leaf-eating beetle *Phytorus pinguis*, previously referred to (E. S. R., 60, p. 844), which apparently reached Guam from the Philippine Islands.

The fig-insect situation in the Smyrna fig district, H. R. Hagan (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 900–909*).—This is a report of observations made during the months of June, July, and August, 1928, in the course of a trip to the Smyrna fig district.

[Insects and disease transmission] (*Far East. Assoc. Trop. Med., Trans. 7. Cong., Brit. India, 1927, vol. 2. pp. 35–39, 44–65, 509–516, 544–547, 613–623, 640–649, 712–739, 745–748, pls. 5, figs. 9*).—The contributions relating to insects and disease transmission here presented include the following: Experiments on the Transmission of Plague by *X[enopsylla] cheopis* and *X. astia*, by A. N. Goyle (pp. 35–39); The Perpetuation of Plague among Wild Rodents, by Wu Lien-Teh (pp. 44–65); Typhus-like Fevers Conveyed by Ticks, by J. W. D.

Megaw (pp. 509–516); An Attempt to Transmit *L[eptospira] icterohaemorrhagiae* by *A[edes] argenteus* and *A. albopictus*, by A. N. Kingsbury (pp. 544–547); Malaria: Mosquito Control in Rural Singapore, by J. W. Scharff (pp. 613–623); The Success of a Scheme Based on Our Systematic and Bionomic Knowledge of Anophelines, by C. Strickland (pp. 640–649); Habits of Anopheles in Relation to Their Rôle in the Spread of Malaria; Importance of Monthly Differences in the Length of Life of *A[nopheles] maculipennis*, by S. P. James, W. D. Nicol, and P. G. Shute (pp. 712–717); Progress towards the Realization of Biological Control of Mosquito Breeding, by R. Senior White (pp. 718–722); Chemical Factors in Relation to Anopheline Breeding, by K. B. Williamson (pp. 723–735); Why Do Anopheles Larvae Feed at the Surface, and How? by S. R. Christophers and I. M. Puri (pp. 736–739); and A Note on Some Experimental Attempts to Transmit Mechanically Malaria Organisms through Mosquito Biting, by B. Mayne (pp. 745–748).

Preliminary notes on the action of strychnine on the Wyoming ground squirrel (Citellus elegans elegans), W. L. Burnett (*Colorado Sta. Press Bul. 72 (1930), pp. 3*).—It is pointed out that poisoned oats are as freely eaten by the Wyoming ground squirrel as the unpoisoned oats, whether at the first or at subsequent feedings up to the point of taking a fatal dose. For economic killing of ground squirrels, a sufficient quantity of the poison should be given the first time to insure their getting a fatal dose.

The results obtained from the feeding of poisoned oats suggest a widely varying inherent individual tolerance for strychnine, a tendency to build up a tolerance for the drug which also varies much in different individuals, and a gradual accumulation of the poison in the squirrel's system. Thus of eight adult squirrels fed 10 kernels of poisoned oats daily the first succumbed on the fifth day and the last on the forty-eighth day.

Tests of various aliphatic compounds as fumigants, R. C. Roark and R. T. Cotton (*U. S. Dept. Agr., Tech. Bul. 162 (1929), pp. 52*).—Three hundred and nine aliphatic compounds tested against the rice weevil in half-liter Erlenmeyer flasks half filled with wheat are reported upon.

"Sixty-six of these compounds were lethal after an exposure of 24 hours, in dosages less than 100 mg. per liter or 6.24 lbs. per 1,000 cu. ft., 18 of these being lethal in the minimum dosage tried, 0.02 cc. per liter (1 to 4 lbs. per 1,000 cu. ft.). The compounds showing the greatest toxicity are in the following classes: Iodides, bromides, mercaptans, thiocyanates, isothiocyanates, disulfides, oxides, epichlorohydrin, halogenated ethers, halogenated esters, and formates. An analysis of the results obtained with the 66 most toxic and the 85 least toxic compounds tested indicates that there is no apparent relation between the boiling point of compounds and their relative toxicity, except that most compounds having a high boiling point (above 150° C.) have too low a vapor pressure at room temperature to furnish a toxic concentration; that branched chain radicals are more toxic than are straight chain radicals; that compounds which are inert chemically have little toxicity; and that some compounds highly reactive chemically do not kill weevils in wheat, probably because they are absorbed by the wheat and fail to reach the insects.

"Germination tests with wheat showed that the chlorides, formates, sulfides, disulfides, thiocyanates, isothiocyanates, and mercaptans in dosages more than sufficient to kill weevils do not injure the germination of the grain. The iodides, halogenated alcohols, epichlorohydrin, halogenated ethers, oxides, and esters of halogenated fatty acids are injurious to the germination of wheat and should be used with caution.

"Many effective compounds are unavailable commercially or are too costly to be of practical value. Seventeen compounds showing promise of commercial value were tested in a 500-cu. ft. fumigation vault. Two of these, ethylene oxide and methyl monochloroacetate, were shown to be slightly more toxic than carbon disulfide. They were lethal at a dosage of 1 lb. per 1,000 cu. ft. The ethyl and isopropyl esters of monochloroacetic acid were only slightly less toxic. Ethylene dichloride in admixture with carbon tetrachloride in the ratio of 3 parts to 1 by volume was lethal at a dosage of 6 lbs. per 1,000 cu. ft. Because of its low cost, effectiveness, and lack of fire hazard and toxicity to human beings, ethylene dichloride should be a useful fumigant."

Surface tension, surface activity, and wetting ability as factors in the performance of contact insecticides.—I, Studies of contact insecticides, W. C. O'Kane, W. A. Westgate, L. C. Glover, and P. R. Lowry (*New Hampshire Sta. Tech. Bul. 39 (1930), pp. 44, figs. 13*).—The progress of investigations commenced in the spring of 1927 is reported upon, in the course of which 10 species of insects were studied. Special apparatus for applying the materials used and for photographing angles of contact was devised and is described and illustrated. It is pointed out that various conceptions have been proposed to define the phenomena commonly called wetting and that the performance of liquid on solid, for which the term extension is used, is not identical with that of liquid on liquid.

The authors find that "the angle of contact, liquid solid, is a valid approach toward an indication of wetting ability. Statements and equations are given to indicate the balance of forces prevailing when a liquid comes into contact with a solid. Solutions of sodium oleate vary in surface tension and angle of contact according to age and concentration. Various ideas have been proposed in the past to define the factors favoring penetration of a liquid into tracheae. Extent and depth of penetration into tracheae may be definitely associated with a degree of toxicity of a given lethal agent. Penetration was studied by dry dissection, utilizing refraction of light. Surface tension alone is not a sufficient index of expected penetration. Calculations of adhesion tension offer suggestive data. In a series of related compounds that exhibit surface activity, relative toxicity is influenced by relative molecular concentration at interfaces. The relative toxicity of various concentrations of a given substance that exhibits surface activity is related to relative molecular concentration at interfaces.

"Ionization, as of nicotine, may affect toxicity through alteration of surface activity and adsorption. Increasing concentrations of a given material, if surface active, may not operate as a straight-line force. Nicotine at successive concentrations exhibits evidences of the effects of increased molecular concentration at interfaces. If surface activity is an important factor in relative toxicity, the laws of adsorption would be expected to have application. Data presented indicate that adsorption phenomena may play a part in relative toxicity. Caproic acid at successive concentrations does not operate as a straight-line force. Higher concentrations, as of sodium oleate, may introduce other factors. Equations are presented applicable to the adsorption tendencies in the members of a homologous series of capillary-active organic substances. Data are presented indicating that the relative toxicity of the normal alcohols conforms to expectations according to adsorption phenomena. Certain compounds appear to introduce the possible influence of molecular orientation on the relative toxicity of related materials."

A list of 36 references to the literature is included.

Studies of spray tank agitation in the use of oil sprays, R. H. Smith (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 929–934*).—Tests made by the California Citrus Experiment Station of 18 orchard sprayers with tanks ranging from 200 to 465 gal. indicated that the speed of the agitator is the most important factor in efficient agitation in the use of oil sprays. Pending a more thorough investigation of the subject, the author has made the tentative recommendations that wide paddles be placed approximately 12 in. apart on the agitator shaft and 6 in. from the ends of the tank, and that the agitator speed be about 225 r. p. m. This equipment has produced a uniform mixture in 400-gal. tanks in tests in which pure oil was poured on the surface of the water in the filled tank and the agitator run for two minutes before starting to spray.

Adherence of some insecticidal dust materials to growing mature foliage, D. F. Barnes and S. F. Potts (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 957–965*).—The authors found that the addition of lime to lead arsenate greatly increased the loss of arsenic, and that lead arsenate adhered better than did calcium arsenate. In adherent properties drying oils were superior to nondrying oils. The relation of leaf expansion and meteorological factors to arsenic concentration and adherence is discussed.

Responses to light of the bud moth and leaf roller, D. L. Collins and M. W. Nixon (*New York State Sta. Bul. 583 (1930), pp. 32, figs. 24*).—The progress on an experiment planned to study the possibilities of catching certain orchard insect pests by the use of light traps is reported.

"During the summer of 1929, 105 water-pan light traps were set, 1 in every tree in a 4-acre section of a large orchard in Monroe County, N. Y. The traps were equipped with 75-watt type 'C' clear Mazda lamps. In all, 27,726 bud moths and 16,432 fruit tree leaf rollers were caught and counted. Bud moth flight began June 18 and was still evident August 22 when the season's experiment was closed. Leaf roller flight began June 23 and ended August 5. The maximum flight of both moths occurred July 7. Temperature was found to be an important regulator of flight. Few Lepidoptera were active when the temperature fell to 60° F. or below:

"Bud moth injury to leaf clusters was from 8 to 26 per cent greater in the unlighted parts of the orchard than in the experimental lighted section. From two to seven times more bud moths were present in unlighted trees than in trees having light traps. Males and females were caught in about equal numbers. Few females had laid their eggs at time of capture. Great numbers of insect pests can be caught in light traps if a suitable light and trap are used. One light trap record may not be taken as typical for any row, nor one row for the orchard. The benefit which may be derived from the operation of light traps should be determined on the basis of catches secured and injury evident in the central portion of a trap-lighted area."

It is considered too early in the course of the experiment to arrive at any definite conclusions on the economic use of light traps to aid in insect pest control.

Sow bug found to be host of parasite of ruffed grouse, a game bird, E. B. Cram (*U. S. Dept. Agr., Off. Rec., 9 (1930), No. 8, p. 5*).—The author here reports upon studies of the small roundworm *Dispharynx spiralis* which had previously been found by New England workers to frequently occur in the glandular stomach of grouse, at times in such numbers as to cause the death of many birds. This parasite—also recorded as affecting the chicken, turkey, pigeon, guinea fowl, and pheasant—is one of a group of roundworms requiring an intermediate host for the development of the stage that is infective for birds. Attempts by the author to develop the parasite in snails, slugs, earthworms, millipeds, ground beetles, crickets, grasshoppers, and sow bugs were successful in the case of the sow bug *Porcellio scaber*. The infestation of ruffed grouse and of bobwhite quail was produced by the feeding of sow bugs in which the infective stage of the larval parasite had been experimentally developed. While the sow bug *P. laevis* had previously been incriminated in

Europe, the present experiments are thought to be the first to furnish conclusive evidence of the identity of the intermediate host in the United States.

Dusting sulphur for the control of cotton-leaf bugs, A. L. Hamner (*Mississippi Sta. Circ. 86 (1929), pp. 4, figs. 4*).—In work conducted at the station in 1929 dusting with a 300-mesh sulfur for the control of the tarnished plant bug, cotton flea hopper, and other insects causing similar damage gave an average increase of 275 lbs. of seed cotton per acre. The increase on the different plants was evidently affected more by the ability of the plants to hold the forms set than by the intervals at which the dust was applied. Plats dusted the second time on the fifth day had the lowest percentage of productive plants while those dusted the second time on the tenth day had the highest. Both the production and the percentage of productive plants indicate that the dust applied at a 10-day interval was as effective as that applied at a 5-day interval.

A study of the cotton flea hopper, Psallus seriatus Reut., with especial reference to its effect on cotton plant tissues, R. H. Painter (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 6, pp. 485–516, figs. 7*).—A study of the anatomy and histology of the alimentary canal and its appendages, of preserved plant material with respect to the effects of the bite of the cotton flea hopper, and also of fresh material of the cotton flea hopper and of infested cotton is here reported upon. The presence of bodies which may be parasites in the anterior part of the salivary gland is considered.

The effect of the feeding of the pest upon the plant cells is described, and a study of the tissues of infested cotton has shown in addition to malformation of the cells the presence of cell inclusions near the site of the puncture. In certain preparations these cell inclusions have the appearance of an invading or developing parasite and have been found in both fresh and preserved plant material. The field experiments have shown that the inoculum or material injected by the cotton flea hopper does not spread far from the point of injury. The appearance of a systemic disturbance, sometimes observed in the infested fields, therefore, seems to be due to the multiplicity of bites, and the shedding of the hopper squares seems to be due to a bite near by. Attention is called to the possible plant-disease transmission by Psallus and the evidence presented.

The rosy aphid in relation to spray practices in 1929, P. J. Parrott and H. Glasgow (*New York State Sta. Bul. 582 (1930), pp. 32, figs. 7*).—The results of a series of experiments designed largely to ascertain the comparative values of different insecticides in combating the rosy apple aphid are here presented, much of the data being given in tabular form. The susceptibility of this aphid with respect to treatment with lime-sulfur and Bordeaux, each containing nicotine sulfate, is considered. Various oil sprays either with or without nicotine preparations were also tested. Lime-sulfur containing nicotine sulfate gave superior results and was regarded as the preferred spray mixture.

It is pointed out that "the object of spraying is to destroy the newly hatched nymphs, and these proved vulnerable to treatment during the period following the separation of the tips of the green leaves of the developing fruit buds and before pink color was displayed appreciably in the central buds of the blossom clusters.

"With the mixtures containing nicotine preparations, the aphiscidal properties varied with the nicotine content, 1 pint of nicotine sulfate to 100 gal. of dilute lime-sulfur being considered the approximate strength to give maximum control at reasonable cost. Lime-sulfur proved to be a more efficient carrier of nicotine sulfate than Bordeaux mixture. Two relatively new insecticides, one a preparation containing Derris and the other containing an 'activator' composed of an oxidized petroleum product, produced results of no special significance, with the exception that the inclusion of the activator in Bordeaux mixture apparently led to increased toxicity."

Timing field liberations of Cryptolaemus in the control of the citrophilus mealybug in the infested citrus orchards of southern California, H. M. ARMITAGE (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 910–915, figs. 2*).—An account of work with the ladybird beetle *C. montrouzieri* Muls., of which 40,000,000 are being produced annually in insectaries in southern California and liberated systematically, 10 beetles per tree, over the several thousand acres of citrus in that area that are infested with the citrophilus mealybug. The beetles are made available for field liberation during the months of April, May, and June, which are optimum as regards their activity.

The protective stupefaction of certain scale insects by hydrocyanic acid vapor, G. P. GRAY and A. F. KIRKPATRICK (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 878–892, pl. 1, figs. 2*).—The experiments here reported led to the conclusion that when a lot of black or red scale is first exposed to a sublethal but stupefying concentration of hydrocyanic acid in air, followed by a normally lethal concentration, more of them are able to survive than of a lot upon which the reverse procedure has been followed. This characteristic has been termed "protective stupefaction." The effect of this phenomenon on commercial fumigation is discussed and suggestions offered for preventing or overcoming it.

The resistance of black scale (Saissetia oleae Bern.) to hydrocyanic acid fumigation, G. P. GRAY and A. F. KIRKPATRICK (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 893–897*).—It is concluded from experiments conducted that the black scale on citrus trees in a part of the San Gabriel Valley, Calif., possesses a degree of resistance not possessed by scale occurring in certain districts outside of the so-called resistant area.

Nematodes parasitic on Diatraea saccharalis Fabricius in Cuba, H. K. PLANK (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 982, 983; also in Trop. Plant Research Found. [Wash., D. C.] Sci. Contrib. 16 (1929), pp. 982, 983*).—The nematodes *Hexameris meridionalis* Steiner and *Cephalobus elongatus* De Man (?) were found by the author to be parasitic on the sugarcane borer during the course of investigations in Camagüey Province, Cuba.

Fungi attacking Diatraea saccharalis Fabricius in Cuba, H. K. PLANK (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 983, 984; also in Trop. Plant Research Found. [Wash., D. C.] Sci. Contrib. 17 (1929), pp. 983, 984*).—A list is given of eight species of fungi thus far found attacking the sugarcane borer in Cuba.

The strawberry crown-moth in Oregon, D. C. MOTE, J. WILCOX, and O. A. HILLS (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 936–943, pl. 1, fig. 1*).—This contribution from the Oregon Experiment Station reports upon studies of the life history and control of *Synanthedon bibionipennis* Boisd. which were conducted in a preliminary way during the spring and summer of 1927 and as a major Purnell project beginning July 1, 1928.

[The velvetbean caterpillar on soybeans], J. M. JENKINS (*Louisiana Stas. Bul. 205 (1930), pp. 11, 12*).—A report is made of the velvetbean caterpillar which attacked soybeans for the first time in southwestern Louisiana in 1929, causing considerable damage. Control work with sodium fluosilicate dust has shown it to be entirely satisfactory. Both calcium and lead arsenate kill the caterpillars but injure or kill the soybean plants and can not be recommended.

Complete research program, European corn borer, 1930 (*U. S. Dept. Agr., Bur. Ent., 1930, pp. II+63*).—This is a mimeographed report of the complete research program for 1930 (E. S. R., 61, p. 553). It includes the report of the joint committees of the American Association of Economic Entomologists, the American Society of Agronomy, the American Society of Agricultural Engineers, the American Farm Economic Association, and the American Society of Animal Production, and the report of the committee on allocation of research work.

Report of the fourth annual conference on European corn borer research, Washington, D. C., February 11, 1930 (*U. S. Dept. Agr., Bur. Ent., 1930, pp. II+19*).—This is a mimeographed report of the proceedings (E. S. R., 61, p. 553).

Dusting for codling moth control in the Willamette Valley, Oregon, 1927–1928, B. G. THOMPSON (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 934–936*).—Two years' experimental work by the Oregon Experiment Station has shown that in the locality of Monroe lead arsenate dust and calcium arsenate dust, when applied under favorable conditions, are effective in controlling codling moth. Since these results are more favorable than those obtained elsewhere in the Northwest by other workers, it is thought that local conditions may have an important influence on them.

A second report on chemically treated bands for the destruction of codling moth larvae, E. H. SIEGLER, L. BROWN, M. A. YOTHERS, and W. P. YETTER, JR. (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 966–972*).—This is a report of work conducted in continuation of that by Siegler, Brown, Ackerman, and Newcomer (E. S. R., 58, p. 348).

Some experiments on the control of the codling moth in Australia, S. L. ALLMAN (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 873–878*).—This is a report of a series of experiments conducted at the Government Experiment Farm, Bathurst, Australia. The efficiency of lead arsenate at a concentration of 20 oz. per 50 gal. of water was found to be practically equal in the cases of (1) one calyx and four cover sprays and (2) four cover sprays only.

The oriental peach moth in Connecticut, P. GARMAN (*Connecticut State Sta. Bul. 313 (1930), pp. 395–451, pls. 12, figs. 9*).—In this bulletin the author brings together the present status of knowledge of the oriental peach or fruit moth [*Laspeyresia molesta* Busck] based upon investigations conducted in Connecticut, presented in large part in tabular and chart form, and a review of the literature in connection with a list of 93 references.

In summarizing control measures it is pointed out that arsenicals are ineffective as well as dangerous on peach trees if applied repeatedly. Nicotine sprays or dusts reduce the infestation considerably but not enough, while lime sprays and talc dusts did not afford protection in the station orchard in 1929. "White oil emulsions gave some reduction but not enough. White oil emulsions with additional materials have not materially increased effectiveness in the field. Materials applied against the overwintering larvae, while apparently effective in laboratory tests, have not yet been proved safe or effective in field practice. Repellents are still in the experimental stage and have not yet been proved of value in field control. Bait pans have not been effective so far, apparently because of the large number of moths in an infested orchard and the relatively small number caught by such means. Cultivation recommended for the last few years has not given the desired relief in heavily infested orchards. There is no doubt, however, that it destroys many larvae and should therefore be continued in the general scheme of control. Paradichlorobenzene will kill most of the larvae that are reached, but can not be depended upon for complete control; and, furthermore, is usually applied before the majority of the larvae spin."

A list is given of 30 parasites of the pest occurring in Connecticut and neighboring States, of which *Macrocentrus ancylivora* Roh. is the most important parasite of the larva, from 80 to 100 per cent parasitism having been observed in August or later in an orchard where liberations had been made of the parasite received from New Jersey. *Glypta rufiscutellaris* Cress., a second larval parasite, was observed to constitute about 70 per cent of the parasites collected on the station grounds in New Haven in 1928 but failed to appear in 1929. The egg parasite *Trichogramma minutum* Riley has been found to occur in considerable numbers in four different orchards in the State, as high as 80 per cent having been found parasitized by September 5 in an orchard at New Haven, it having risen from 20 per cent on June 21. Liberations of *T. minutum* material received from the U. S. D. A. Bureau of Entomology laboratory at Arlington, Mass., were made at Southington with a view to colonizing the parasite. Studies of the life history of the pest and of its parasites in New Jersey by Stearns (E. S. R., 60, p. 62) and by Stearns and Peterson (E. S. R., 61, p. 661), have been noted.

Field studies of the pale western cutworm (Porosagrotis orthogonia Morr.), W. C. COOK (*Montana Sta. Bul. 225 (1930), pp. 79, pl. 1, figs. 14*).—In the present bulletin the author summarizes the status of knowledge of the pale western cutworm, which first attracted attention in the Province of Alberta, Canada, in 1911. It was reported as damaging wheat at Brady, Mont., in 1915, and from 1918 to 1921 it increased in numbers throughout the Plains region of Montana until in 1921 it was reported from every county east of the Continental Divide. A few scattered reports of damage were received in 1922 from the region west of Havre, since which time the species has been of slight economic importance. Earlier studies of the insect conducted at the station were reported upon by Parker, Strand, and Seamans in 1921 (E. S. R., 46, p. 352), by Seamans in 1923 (E. S. R., 49, p. 155), and by the author in 1924 (E. S. R., 50, p. 846), 1926 (E. S. R., 54, p. 554), 1927 (E. S. R., 58, p. 559), and 1928 (E. S. R., 59, p. 760).

Following the introduction the account deals with the life history (pp. 8–31), natural enemies (pp. 31, 32), control measures (pp. 33–62), and climatic relations of the pale western cutworm (pp. 62–78). It is followed by a list of 23 references to the literature.

The eggs are largely laid in the soil in fresh stubble early in September and normally overwinter before hatching, but all are hatched by May 1. The larvae feed under ground except when forced to the surface by rain. Before pupating they enter a long prepupal stage which varies greatly in length in different places and years. The adults fly in late August and early September. They feed for 4 or 5 days before ovipositing and have a total life of about 10 or 11 days. Probably from 250 to 300 eggs are laid, and this number is influenced by temperature conditions. Very few eggs are laid after 10 p. m., or at temperatures below 12° C. (54° F.). The moths feed upon the nectar of goldenrod and several species of rabbit brush and have a regular diurnal cycle of activity. Egg laying takes place in late afternoon, and is followed by feeding and mating.

The control of the pest is rather difficult, poisoned baits being useless unless combined with soil packing. The use of a press drill is recommended in seeding wheat. Irrigation whenever it can be applied will check all damage. A list is given of a number of parasites of the cutworm, and mention is made of several wasps and birds known to prey upon it. In spite of the considerable number of its enemies they appear to have been of little value in checking the outbreak in 1922.

The pigeon fly—an important pest of pigeons in the United States, F. C. BISHOPP (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 974–980*).—This is an account of *Pseudolynchia maura* Bigot, which has become an important pest of the pigeon in many parts of the United States, especially in the South. It is considered probably the most important pest of pigeons on account of the annoyance caused by its bite and the blood loss when it becomes numerous.

Thorough cleaning of the pigeon nests at intervals not to exceed 25 days is advocated in order to destroy the pupae before the flies have had time to emerge. Dusting the squabs and pigeons with fresh pyrethrum powder, Derris powder, or tobacco powder containing about 6 per cent nicotine kills a large percentage of the insects. An aqueous extract or pyrethrum with soap, used as a dip, is effective, as is also Derris extract, soap, and water. Kerosene extract of pyrethrum, used as a light spray, kills the flies in buildings or on the birds.

The pigeon fly and pigeon malaria in Iowa, C. J. Drake and R. M. Jones (*Iowa State Col. Jour. Sci., 4* (*1930*), *No. 2, pp. 253–261, pls. 3*).—This is an account of observations of the hippoboscid *Pseudolynchia maura* (Bigot), a blood-sucking parasite of the pigeon, first reported from Iowa in 1916. A report of observations of this insect by Bishopp is noted above. An outbreak of pigeon malaria due to *Haemoproteus columbae*, which is transmitted by this fly, occurred in Iowa during the summer.

The cherry fruit-flies, R. H. Pettit and G. S. Tolles (*Michigan Sta. Circ. 131* (*1930*), *pp. 11, figs. 9*).—This is a practical account of the white-banded fruit fly (*Rhagoletis cingulata*), officially known as the cherry fruit fly or the cherry maggot, and the dark-bodied fruit fly *R. fausta*. These are almost indistinguishable one from the other in the larval stage and are known as cherry maggots because of the habit of the larvae, which feed in ripening cherries and often cause severe losses. It is pointed out that the cherry maggot is likely to be found in Michigan wherever cherries are grown. The dark-bodied species, which prefers sour to sweet cherries, is also present in the State, although thus far it appears to be restricted to small areas in Van Buren and Kent Counties.

The walnut husk fly (Rhagoletis juglandis Cresson), A. M. Boyce (*Jour. Econ. Ent., 22* (*1929*), *No. 6, pp. 861–866, pl. 1*).—This is a contribution from the California Citrus Experiment Station on *R. juglandis*, which has infested English walnuts in southern California for several years, although its correct identity was not known until the beginning of the 1928 season. The nature of its injury to the English walnut, its life history and habits, and its possible control are briefly discussed.

Studies on Microsporidia parasitic in mosquitoes.—VIII, On a microsporidan, Nosema aedis nov. spec., parasitic in a larva of Aëdes aegypti of Porto Rico, R. Kudo (*Arch. Protistenk., 69* (*1930*), *No. 1, pp. 23–38*).—This is a report of studies on a microsporidan, *N. aedis* n. sp., parasitic in a larva of the yellow fever mosquito in Porto Rico.

Methods used in testing materials as repellents against the Japanese beetle, F. W. Metzger (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 7, pp. 659–671, figs. 6*).—Five methods used during 1927 and 1928 in testing 430 materials, alone and in combination, as repellents for the Japanese beetle, in which more than 1,500 tests were conducted, are reported upon.

"Tests of volatile materials in comparison with known attrahents, as conducted by method 1, give indication of the probable value of such substances as repellents in a comparatively short time, and with the use of a small quantity of each material. This method indicates, further, that certain groups of chemicals are much more likely to be repellent to the beetle than others. The use of method 2, in which entire trees are sprayed or dusted, presents a means for testing volatile and nonvolatile materials on a scale comparable to that of practical control operations. Method 3 makes it possible to ascertain the value of a nonvolatile material as a repellent under cage conditions with a minimum expenditure of time and material. Vaporizers, used in method 4, furnish a useful means for increasing the vapor concentration of volatile materials and of testing the value of such substances as repellents. A number of miscellaneous vapor-dispensing devices, employed in method 5, failed to give satisfactory results when used with certain materials."

[The Mexican bean beetle in Georgia] (*Georgia Sta. Rpt. 1929, pp. 21, 22*).—In control work with the Mexican bean beetle calcium arsenate dust alone was fatal to the bean plant, sodium fluosilicate caused more than 50 per cent injury to the plant, and sodium fluosilicate with 66 per cent of fuller's earth caused about 25 per cent damage. Sodium fluosilicate, calcium arsenate, zinc arsenate, or magnesium arsenate used with 66 per cent of lime gave fair control of the beetles when thoroughly applied, with little, if any, burning of the plant. When applied as a spray, magnesium arsenate alone caused no injury, and zinc arsenate caused only slight burning.

Accurate counts of beetles on plats sprayed, dusted, and untreated showed 20, 50, and 100 per cent infestation 3 days after the second application. The maximum number of dead beetles resulting from an application of poison is found on the third and fourth days after the poison is applied, showing that arsenate is a slow poison. This experiment indicates that spraying is more than twice as effective as dusting with the same poison.

The Mexican bean beetle and its control (second report), N. F. Howard and L. W. Brannon (*Virginia Truck Sta. Bul. 70 (1930), pp. 799–808, figs. 4*).—A practical summary of information on this pest and its control is presented as a second report, the first being by Chapman and Gould (E. S. R., 61, p. 757).

The Mexican bean beetle in the East and its control, N. F. Howard (*U. S. Dept. Agr., Farmers' Bul. 1624 (1930), pp. II+14, figs. 10*).—A revision which supersedes Farmers' Bulletin 1407, previously noted (E. S. R., 51, p. 554).

Potato flea-beetles in Washington: Epitrix subcrinita Leconte, Epitrix cucumeris Harris, R. L. Webster and W. W. Baker (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 897–900*).—In control experiments conducted with the potato flea beetles the most satisfactory results from insecticide dusts were obtained from using a combination of hydrated lime, finely ground sulfur, and nicotine sulfate, representing an actual nicotine content of 2 per cent.

Three California ambrosia beetles, R. W. Doane and O. J. Gilliland (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 915–921*).—This is an account of *Monarthrum scutellare* Lec. and *M. dentigerum* Lec. infesting oaks and *Gnathotrichus sulcatus* Lec. infesting Douglas fir, including descriptions of the galleries and of the ways in which they cultivate and feed on the fungus.

Origin of the bean weevil, Mylabris obtectus (Say), E. O. Essig (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 858–861*).—This is a review of the history of the bean weevil, first described by T. Say in 1831 from specimens taken in Louisiana.

Diluted calcium arsenate for boll weevil control, E. F. Grossman (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 972–974*).—This is a contribution from the Florida Experiment Station. The completion of experimental tests extending over a period of three years led to the conclusion that calcium arsenate diluted with hydrated lime, when well mixed and distributed, will control the weevil as well as the undiluted material (E. S. R., 58, p. 760).

Cotton dusting for weevil control, S. Stewart (*Louisiana Stas. Bul. 204 (1930), p. 9*).—In work on boll weevil control at the North Louisiana Station calcium arsenate, applied at the rate of 8 or 10 lbs. per acre with dust guns when the infestation reached approximately 10 per cent and repeated every 4 days until 3 applications had been made, resulted in a profit of $14.10 per acre above the cost of dusting in 1928 and of $6.26 per acre in 1929.

[Report of apicultural work at the Wyoming Station] (*Wyoming Sta. Rpt. 1929, pp. 22, 23*).—During the season of 1928 in two apiaries in the vicinity of Laramie, Caucasians produced 92 lbs. per colony as compared to 48 lbs. per colony for the Italians, due to the fact that the Caucasians built up in hive strength more rapidly in the spring than the Italians and thus reached a peak of producing capacity early in the honey season. On the other hand, four of six Caucasian colonies kept in a yard at Bosler, about 18 miles north of Laramie, died during the winter of 1928–29, while all of the Italian colonies survived. The late cold spring of 1929 produced heavy losses of bees in the yards due to the fact that the honey inside the hives granulated before there was sufficient food outside. Of the five methods of winter packing of colonies tested on the campus, the tar paper pack with no special ventilation gave the best results when measured by the weight of bees surviving in the spring. Two colonies with no packing wintered better than those packed in sawdust or one packed in tar paper with special ventilation, although at the yard on the farm near Laramie all four colonies that were not packed died.

New contributions to the technique of instrumental insemination of queenbees, L. R. Watson (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 944–954, pl. 1, figs. 9*).—This contribution supplements the accounts previously noted (E. S. R., 60, p. 252).

Preliminary report on the investigations of the source of diastase in honey, G. H. Vansell and S. B. Freeborn (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 922–926, fig. 1*).—This is a contribution from the California Experiment Station. American honeys have been condemned as overheated on the European market because they were lacking in diastatic activity. Certain comb honeys that could not have been heated were found to be too low in diastase to pass the official German test. There is perfect correlation between the amount of pollen in the honey and its diastatic activity, but experiments thus far have failed to produce as high diastatic values with artificial pollen cultures as with normal honeys. Field evidence is introduced to show why certain honeys are low in pollen and diastase. Suggestion is made that the pollen count be used as an adjunct to the official diastase test.

Diastase in honey, G. H. Vansell (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 926–929, figs. 3*).—Investigations have shown that many comb honeys are naturally low in diastase and that heating injures the diastase present.

Notes on the rearing of Ascogaster carpocapsae, a braconid parasite of the codling moth, H. L. Dozier and H. G. Butler (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 954–957*).—This contribution from the Delaware Experiment Station includes tables that record the incubation period of codling moth eggs exposed to oviposition by the parasite *A. carpocapsae*, the length of the larval feeding period when similarly exposed, and the length of the period elapsing from the time the codling moth larvae left the fruit until the emergence of the adult parasite.

Sulfur as an insecticide, E. R. de Ong and M. Huntoon (*Jour. Econ. Ent., 22 (1929), No. 6, pp. 866–873*).—The experiments reported show that commercial control of the several species of thrips attacking citrus trees is entirely possible with two or three applications of the higher grades of dusting sulfur. Control work with the citricola scale (*Coccus citricola* Campbell) showed dusting sulfur to compare favorably at the higher temperatures with the control obtained by spraying. Data obtained indicate that the larval stage of the black scale is also susceptible to similar treatment.

ANIMAL PRODUCTION

Calorific value of soluble carbohydrates in feeding stuffs, L. A. Allen (*Jour. Agr. Sci. [England], 18 (1928), No. 4, pp. 691–701*).—The calorific values of the soluble carbohydrates of flaxseed, oats, straw, palm kernel cake, peanut cake, soybean cake, cottonseed cake (decorticated), cottonseed cake (undecorticated), tick bean, fox wheat, mangold, and cottonseed were determined with a bomb calorimeter at the University of Reading, England. The values varied from 3,824 calories in the case of peanut cake to 4,864 calories in the case of straw. The generally high values for the carbohydrates and the variations were attributed to the presence of carbohydrates of a complex nature which were either wholly or partially hydrolized by dilute acid or alkali.

A short note on the nutritive value of linseed cake, J. Stewart (*Jour. Agr. Sci. [England], 18 (1928), No. 4, pp. 702, 703*).—In a test with a single lamb at Cambridge University, England, the animal was fed linseed cake alone at the rate of 20.3 lbs. per week for 22 weeks. Using a method based on that proposed by Wood (E. S. R., 58, p. 565), a starch equivalent for linseed cake was found that agreed quite satisfactorily with that of Kellner.

Inspection of commercial feedstuffs, P. H. Smith et al. (*Massachusetts Sta. Control Ser. Bul. 50 (1929), pp. 33*).—This is the usual report of the official chemical and microscopic analyses of 1,670 samples of feeding stuffs intended for livestock and poultry consumption, collected during the year ended September 1, 1929 (E. S. R., 61, p. 59).

[Beef cattle experiments at the Wyoming Station] (*Wyoming Sta. Rpt. 1929, pp. 11, 12, 45, 46*).—The results of two studies are noted, both of which have been continued (E. S. R., 60, p. 761).

Subsequent effects of different methods of wintering beef calves.—Calves wintered on barley and alfalfa hay gained at the rate of 1.36 lbs. per head daily during a 140-day pasture season, those wintered on native hay and cottonseed cake gained 1.23 lbs. per head on pasture, while those wintered on native hay and barley gained 1.43 lbs. per head per day on pasture.

[*Cattle feeding at the Worland Substation*].—Steers averaging 1,060 lbs. each made for 100 days an average daily gain of 2.68 lbs. per head on a ration of barley, wet pulp, and alfalfa; 2.65 lbs. per head on cottonseed cake, corn silage, and alfalfa; 2.01 lbs. on wet pulp and cut alfalfa; 2.05 lbs. on corn silage and cut alfalfa; 2.08 lbs. on wet pulp and alfalfa; 2.27 lbs. on barley, corn silage, and cut alfalfa; and 2.31 lbs. on cottonseed cake, wet pulp, and cut alfalfa.

The most economical ration from the standpoint of feed cost per 100 lbs. of gain was beet pulp and long alfalfa. In this test cutting the alfalfa did not increase the rate of gain, nor did it save hay or pulp. The least efficient ration from the standpoint of cost per unit of gain was cottonseed cake, wet pulp, and cut alfalfa.

[Lamb feeding studies at the Wyoming Station] (*Wyoming Sta. Rpt. 1929, pp. 35, 36, 41, 42, 43, 44*).—The results of experiments, most of which have been continued (E. S. R., 60, p. 762), are noted.

[*Lamb feeding at the Eden Substation*].—Over a 100-day feeding period 68-lb. lambs made an average daily gain of 0.27 lb. per head on a ration of barley and alfalfa hay. They required 314.1 lbs. of grain and 782.4 lbs. of hay per 100 lbs. of gain. On a ration of equal parts of oats and barley and alfalfa hay similar lambs gained at the rate of 0.3 lb. per head daily and consumed 303.4 lbs. of grain and 728.3 lbs. of hay per 100 lbs. of gain. When the grain ration consisted of 80 per cent of barley and 20 per cent of oats, an average daily gain of 0.3 lb. per head was obtained.

A gain of 0.23 lb. per head daily was produced on a ration of barley and oat-and-pea hay, and it required 357.3 lbs. of barley and 1,050 lbs. of hay to produce 100 lbs. of gain.

[*Lamb feeding at the Torrington Substation*].—In a 100-day feeding test 57-lb. lambs made an average daily gain of 0.38 lb. per head on a ration of barley, cottonseed cake, wet pulp, and alfalfa; 0.35 lb. on corn, cottonseed cake, and alfalfa; and 0.3 lb. on barley, cottonseed cake, dry pulp, and alfalfa. The feed cost per unit of gain was highest in the second lot, but this lot was the best finished lot in the test.

[*Lamb feeding at the Worland Substation*].—In this study 66-lb. lambs were fed for 100 days on various combinations of cull beans, whole barley, cottonseed cake, corn silage, wet beet pulp, cut alfalfa, long alfalfa, and bean hay. A ration consisting of cottonseed cake, wet beet pulp, and whole alfalfa; and another made up of whole barley, wet beet pulp, and cut alfalfa produced gains of a little more than 0.3 lb. per head daily, while all other combinations produced gains of less than 0.25 lb. per head daily. Grinding the alfalfa increased the rate of gain less than 0.01 lb. per head daily, but the lambs on cut hay consumed 3,053 lbs. of wet pulp and 512.9 lbs. of hay per 100 lbs. of gain as compared with 3,167 lbs. of pulp and 708.5 lbs. of long alfalfa hay. Corn silage and cut alfalfa proved to be the most expensive ration in this test.

Wool fineness as influenced by rate of growth, J. I. HARDY and J. B. TENNYSON (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 5*, *pp. 457–467*, *figs. 6*).—To study the influence of rate of growth of wool on its quantity and quality, 5 Corriedale ewes were selected by the Bureau of Animal Industry, U. S. D. A., and wool clippings were made at 28-day intervals. From an area about 0.5 in. square located about 3 in. to the rear of the point of the shoulder and about half way between the back and belly, the wool was clipped close to the skin for the initial sample. After 28 days' growth 2 small samples were removed from this area and the remainder clipped away for another period of growth. At the same time a small lock was tied close to the skin on each side of the sheep and the process repeated at 28-day intervals on the same lock. The wool fibers were weighed and measured for length and diameter.

In this study the rate and fineness of wool growth varied during the year, the greatest and coarsest growth occurring during the summer and fall, and the least and finest in midwinter. The greatest growth in length appeared to be correlated with the largest diameter of fiber and vice versa. The period of greatest growth was associated with a general thrifty condition of the sheep, while the period of least growth usually occurred at lambing time and the 45 preceding days. The weight of the wool fiber increased with the increase in length and diameter. The results indicate that the sheep raiser can largely control the quantity and quality of the wool produced by controlling the thriftiness of his sheep.

Karakul sheep, J. L. LUSH, J. M. JONES, and R. E. DICKSON (*Texas Sta. Bul. 405* (*1930*), *pp. 20*, *figs. 8*).—A series of studies with Karakul sheep was begun in 1912 and discontinued in 1929. During this period it was found that this breed of sheep is hardy, vigorous, and long-lived. The ewes proved to be good mothers, and the lambs were large at birth and grew rapidly. The wool production was slightly less on the grease basis than that of the Rambouillet, and the wool produced was classed as carpet wool.

It was found difficult to dispose of small lots of lamb skins profitably, due to their lack of uniformity. Also there was usually a discrimination made against these animals when sold for mutton. Based on the results observed in this study, it is concluded that from a business standpoint the breeding of Karakul sheep should be regarded as still in the experimental stage.

Observations of genetic interest are presented of inheritance of such characters as ear length and wattles in Karakul sheep.

Feeding experiments with swine (*Georgia Sta. Rpt. 1929, pp. 14, 15, fig. 1*).—Continuing these studies (E. S. R., 61, p. 161), it has been found that velvetbeans are decidedly inferior to corn as a feed for swine. Velvetbeans produce unsatisfactory gains, are unpalatable, and in many cases have a bad effect on the health of the pigs. Feeding cod-liver oil as a supplement to velvetbeans had no apparent beneficial effect, and fresh green soiling crops also failed to give better results. On the other hand, the addition of commercial ferrous sulfate increased slightly the gains obtained with velvetbeans.

[Feeding studies with swine at the Guam Station], C. W. EDWARDS (*Guam Sta. Rpt. 1928, pp. 7, 8*).—The results of studies in continuation of those previously reported (E. S. R., 60, p. 858) are noted.

Breadfruit, cassava, and coconut for young pigs.—A litter of weanling pigs in rather poor condition was fed a ration composed of equal parts of breadfruit, cassava, and fresh coconut, and in addition received fresh Para grass twice daily. During the 60-day test 3 pigs died, 2 failed to make any appreciable gain, and the remainder gained at the rate of only 0.2 lb. per head daily.

Cassava, coconut meal, and tankage for young pigs.—A lot of 5 gilts 4 months of age were fed for 70 days on a ration of fresh cassava and coconut meal 2 : 1 plus 2 oz. of tankage. They were kept in a dry lot and fed fresh Para grass twice daily. The average daily gain on this ration was 0.38 lb. per head.

Breadfruit, coconut meal, and tankage for young pigs.—A group of 7 70-day-old gilts were fed a ration of equal parts of coconut meal and cooked breadfruit for 65 days on Para grass pasture. They also received a daily allowance of 1 oz. of tankage per head. The average daily gain on this ration was 0.82 lb. per head. In a second test with 5 77-day-old gilts this ration produced gains of 0.8 lb. per head daily over an 80-day period. The cost of feed per 100 lbs. of gain, exclusive of pasture, was $3.78 in the first test and $4 in the second test.

Coconut meal and cassava for brood sows.—During the entire gestation period 3 sows received a ration of fresh cassava and coconut meal 2 : 1 and during the suckling period 2 oz. of tankage per day was added to each sow's ration. At the time the pigs were weaned one sow was in poor condition and the other two were in only fair condition.

[Hog studies at the Wyoming Station] (*Wyoming Sta. Rpt. 1929, pp. 12, 13, 35, 37, 39, 40*).—The results of several experiments are noted.

Wyoming grains for hogs.—Lots of hogs averaging 133 lbs. per head made an average daily gain of 1.01 lbs. each on rations of barley during the period from March 20 to August 15, while similar hogs fed corn gained at the rate of 1.03 lbs. per head daily (E. S. R., 60, p. 765). Based on the feed consumed per unit of gain, the barley used in this test had about 92 per cent the feeding value of the No. 3 shelled yellow corn. There was little difference in the dressing percentage or finish of the hogs fed corn and barley.

The three breeds used in this test made the following average daily gains per head: Spotted Poland China 1.09 lbs., Hampshire 1.04 lbs., and Berkshire 0.94 lb. They ranked in the same order in economy of production. The dressing percentages were Berkshire 80.6, Hampshire 78.4, and Spotted Poland China 77.4 per cent, and the carcass scores were Hampshire 91.4, Berkshire 87.6, and Spotted Poland China 82 per cent.

In another trial 4 lots of pigs received a tankage and mineral mixture. In addition corn, barley and rye equal parts, barley, and rye were fed. The average daily gains in the respective lots were 1.06, 1.01, 0.98, and 0.94 lb. per head.

[*Hog feeding at the Eden Substation.*]—Pigs averaging 99 lbs. each and self-fed for 70 days on a ration of ground barley and tankage gained at the rate of 1.7 lbs. per head daily, those self-fed whole barley and tankage self-fed 1.23 lbs. per head, and those hand-fed whole barley 1.08 lbs. per head. The cost of 100 lbs. of gain was cheapest in the lot self-fed ground barley and most expensive in the lot hand-fed whole barley.

[*Hog feeding at the Gillette Substation*].—During a 75-day feeding period hogs averaging 100 lbs. each made an average daily gain of 1.3 lbs. per head on a ration of corn, tankage, minerals, and alfalfa; 1.24 lbs. on corn, tankage, and minerals; 0.84 lb. on corn and minerals; and 0.75 lb. on corn, minerals, and alfalfa. The cost of 100 lbs. of gain was cheapest in the first lot, followed in ascending order by the respective lots.

[*Hog feeding at the Sheridan Substation*].—In cooperation with the U. S. Department of Agriculture, 155-lb. hogs were fed for 70 days on a combination of tankage, minerals, and alfalfa, to which was added corn, barley, hull-less barley, or rye. On these combinations the hogs made average daily gains of 1.7, 1.64, 1.72, and 1.69 lbs. per head, respectively. The lot receiving corn made the most expensive gains, followed in descending order by barley, hull-less barley, and rye. There was no considerable variation in the amount of basal feed eaten in the different groups. Disregarding differences in other parts of the ration, 444.6 lbs. of corn were equal to 447.7 lbs. of rye, 441.3 lbs. of barley, or 443.4 lbs. of hull-less barley. A ration of hull-less barley, minerals, and alfalfa produced an average daily gain of 1.73 lbs. per head at a cost of 10 cts. per 100 lbs. of gain less than the rye combination. In this ration 475 lbs. of hull-less barley produced as much gain as 443.4 lbs. of hull-less barley plus 27.7 lbs. of tankage, but 10 lbs. more of minerals were eaten.

Some preliminary experiments on the value of small quantities of whole cows' milk when fed to pigs, A. H. Blissett and J. Golding (*Jour. Agr. Sci. [England], 18 (1928), No. 4, pp. 642–648*).—This is a report of results obtained in preliminary experiments at the National Institute for Research in Dairying, Reading, England, in which 0.5 pint of milk per head daily was fed to pigs on well-balanced rations. Marked differences were observed in many of these studies.

[Poultry studies at the Wyoming Station] (*Wyoming Sta. Rpt. 1929, pp. 13, 14, 16*).—The results of two experiments made by F. J. Kohn are reported in continuation of those previously noted (E. S. R., 60, p. 768).

Feeding turkeys.—A pen of turkeys on a restricted diet with no green feed, eggs, or direct sunlight and just enough cod-liver oil to keep the birds from dying developed leg weakness by the end of the third week.

Turkeys fed green chopped alfalfa weighed more per head and consumed less grain mixture after 3.5 months than a lot on bromegrass pasture. At the end of 5 months both lots weighed practically the same, but the alfalfa-fed lot had consumed about 11 lbs. less grain mixture.

Turkeys receiving 11 per cent of animal protein in their ration made practically as good growth as those receiving 20 per cent of animal protein.

Feeding chickens at high altitude.—On a ration composed of 100 lbs. of mill-run, 100 lbs. of ground oats, 200 lbs. of ground barley, 100 lbs. of meat scrap, and 3 lbs. of salt, egg production dropped in 4 weeks from 45 to 47 eggs per day to 12 to 15 eggs per day. No such drop occurred in a lot fed the same ration except that corn replaced the barley. The production of the first lot started to rise the fourth day after corn replaced the barley.

Digestibility trials with poultry, IV–VI, E. T. Halnan (*Jour. Agr. Sci. [England], 18 (1928), No. 4, pp. 634–641, 766–771*).—The digestibility trials with poultry at the University of Cambridge, England, have been continued (E. S. R., 62, p. 368).

IV. *The digestibility of certain varieties of oats* (pp. 634–638).—Digestion trials were conducted with Gray Winter, Black Bountiful, and Scotch Potato varieties of oats, using two White Leghorn cockerels as experimental animals in each case. The experimental periods lasted 12, 16, and 16 days, and the individual birds were fed 80, 60, and 80 gm. of oats per day, respectively.

The Gray Winter variety proved to be more suitable as a source of nutrients for poultry than either of the other varieties. The fiber content of the oats appeared to affect its value for poultry, the thin-husked varieties being best suited for this purpose. Poultry apparently do not relish oats.

V. *The digestibility and feeding value of bulrush millet* (*Pennisetum typhoideum*) (pp. 639–641).—Bulrush millet proved quite palatable to cockerels, laying hens, and young chicks. A digestion trial was conducted, using two White Leghorn cockerels as experimental birds and feeding 110 gm. of millet per head daily during a period of 20 days.

The millet was found to be readily digested by poultry and proved to be very suitable as a source of nutrients for poultry of all ages. In composition and digestibility bulrush millet was approximately equal to Little Joss wheat as a source of food for poultry.

VI. *On the influence of the size of a ration upon its digestibility* (pp. 766–771).—Four White Leghorn cockerels were fed a Sussex ground oats and milk mixture in amounts varying from a submaintenance ration of 50 gm. to a "limit of appetite" ration of 150 gm. per head daily.

A slight depression in the coefficients of digestibility of organic matter, crude protein, and nitrogen-free extract occurred with the increase in size of ration, and a slight increase in the coefficient of digestibility of ether extract was obtained. However, these differences were attributed to normal fluctuations due to individual variations and were not considered significant. The results indicate that the coefficients of digestibility of food nutrients are not materially affected by variations in the amounts of food fed.

Fowls of forest and stream tamed by man, M. A. Jull (*Natl. Geogr. Mag., 57 (1930), No. 3, pp. 326–371, pls. 16, figs. 27*).—In this article the author describes in a popular manner the various domesticated breeds of turkeys, peafowls, guinea fowls, ducks, geese, and swan. A brief history of the domestication and early uses of these fowl is included. Illustrations of the various breeds in natural colors have been prepared by H. Murayama, and in addition the text is supplemented by many illustrations.

DAIRY FARMING—DAIRYING

[Feeding studies with dairy cattle at the Guam Station], C. W. Edwards (*Guam Sta. Rpt. 1928, pp. 6, 7*).—A ration of local feeds composed of 100 lbs. of ground corn and 80 lbs. of coconut meal was compared with a ration made up of 100 lbs. of corn and imported feeds composed of 50 lbs. of oats, 25 lbs. of wheat bran, and 25 lbs. of cottonseed meal. The rations were fed during alternate 35-day periods to 5 cows and 47-day periods to 1 cow. The first 5 days of each period were considered preliminary. The cows were on pasture during the day and, in addition to the grain, received coarse green forage.

In the case of 4 cows there were differences in milk yield of 158.67, 85.23, 56.65, and 73.99 lbs. in favor of the local ration. With 2 cows there was a difference of 13.33 and 46.23 lbs. of milk in favor of the imported ration.

Studies on corn silage (*Connecticut Storrs Sta. Bul. 162 (1929), p. 14*).—According to this brief note, during a 100-day test 4 cows receiving 36 lbs. of silage per head daily plus hay ad libitum and grain consumed 14,408 lbs. of silage, 3,749 lbs. of hay, and 2,993 lbs. of grain and produced 8,832.8 lbs. of 4 per cent milk at a cost of $2 per 100 lbs. A similar lot fed 18 lbs. of silage per head daily ate 7,200 lbs. of silage, 5,020 lbs. of hay, and 2,916 lbs. of grain and produced 8,736 lbs. of 4 per cent milk at a cost of $1.75 per 100 lbs. The lighter group of cows did not maintain their weight quite as satisfactorily.

A preliminary trial with moist and dehydrated silage showed the value of the succulence of silage as indicated by the greater decrease in milk yield of the cows fed the dehydrated silage.

[Experiments in dairying at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 162 (1929), pp. 14–16*).—The results of two experiments are briefly noted.

Effect of storage on precipitation of milk proteins in skim milk.—Continuing this study (E. S. R., 59, p. 468), 6 lots of raw and sterile skim milk were stored for 6 months at —14 and +10° F. The average precipitation of milk proteins was measured at the end of each month. Precipitation began after 2 months' storage at 10° in both the raw and sterile groups, but the rate of precipitation was highest in the raw group. No precipitation occurred in either group held at —14° until the end of the third month and was slight at all times throughout the test.

The lots held at 10° were unfit for commercial use after 2 months' storage, while those held at —14° remained in good condition until the end of the fifth month, but by the end of the sixth month had developed a "storage" flavor. Raw skim milk at both —14 and 10° developed a "cardboard" flavor at the end of the first month's storage, which increased slightly as the storage period progressed. The sterile milk never developed this off flavor.

Chemical changes occurring in skim milk during storage.—In raw skim milk held at —14 and +10° F. a slight progressive increase in amino nitrogen occurred during the first 4 months of storage. After this period there was a slight decrease in amino nitrogen in the case of raw skim milk held at —14°, while with that held at 10° the amino nitrogen decreased slightly the fifth month and increased the sixth month. The sterile skim milk increased slightly in amino nitrogen until the end of the second month, and then decreased slowly until at the end of the trial the amount present was approximately equal to that present at the beginning of the test.

Electric cooling of milk on the farm, J. C. Marquardt and A. C. Dahlberg (*New York State Sta. Bul. 581 (1930), pp. 20, figs. 3*).—This study was made to determine the dependability of electric refrigerators for cooling milk, the cost of operation, the value of insulating material in the storage tank, and the proper method of cooling milk. The storage tank used was insulated with 3 in. of cork made water-tight by hot asphalt. Milk was cooled in three different ways, namely: "(1) The can of freshly drawn milk was set into the tank of water without previous cooling, the lid was tightly put in place, and the milk was not agitated in any way; (2) the milk was treated as in 1, except that it was stirred after one- and two-hour periods; and (3) the milk was cooled by a surface tubular cooler to the required temperature before placing in the tank of water."

This study demonstrated that electric refrigerators are practical, require little attention, are reliable, and afford a constant source of refrigeration with no special labor requirements.

A 4-can tank was found to be the smallest size that could be used economically. Based on a year's results, it required 1.08 kw. hours of electricity to cool 100 lbs. of milk. The insulating material saved its cost during the first summer and was found to be essential in securing and maintaining low temperatures. It was further demonstrated that milk could be satisfactorily cooled by placing it immediately after the can was filled in cold water at 42° F., and that it need not be stirred or surface cooled. Bacterial counts from the various samples of milk indicated that stirring, even under sanitary conditions, increased slightly the number of bacteria present.

VETERINARY MEDICINE

[Work with animal diseases at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 162 (1929), pp. 9–13*).—A brief mention is made of the results of eradication and control work throughout the State by the use of the system successfully employed in the college herd. Further studies of the metabolism of the abortus-melitensis group have demonstrated that the ability of *Brucella abortus* of bovine origin to employ glucose may be lost after long cultivation on plain Fairchild's agar. "Attempts to restore this lost property by repeated transfers on nutrient agar, dextrose agar, and liver infusion agar were only partially successful, while repeated transfers in nutrient broth and dextrose broth were entirely unsatisfactory, mainly because the test cultures failed to grow after several transfers in these media. However, if the test strains were passed three times through liver infusion broth with continuous incubation at 37° C. during a period of two weeks a pellicle and a viscid sediment developed. Cultures which have undergone this change have been called 'mucoid forms.' Sugar results with this form have been very uniform." Isolations made from plates inoculated with *B. abortus* of human and porcine origin and *B. melitensis* used from 0 to 22 per cent glucose. None of the isolations made from the test bovine culture utilized sugar.

"While studying the factors influencing glucose utilization, it was found that prolonged growth in liver infusion broth gave rise to a new form which possessed certain very definite characteristics. Because of its viscid slimy appearance in liver broth it has been called mucoid form. All of the bovine, human, and porcine strains of *B. abortus* and the majority of *B. melitensis* strains tested could be converted into this form. Individual colonies of the mucoid form were found to be indistinguishable in appearance from the ordinary laboratory forms. On agar slants the mucoid form produced a growth somewhat viscid in character but otherwise identical with the ordinary cultures. The sugar utilizing and dye characteristics of the mucoid forms were found to be unusually clear-cut. The ability to use glucose was restored to strains of human and porcine origin, as well as *B. melitensis* which had lost the ability to use glucose after conversion into the mucoid form.

"Antigens prepared with mucoid forms were found to be inagglutinable by antisera prepared with homologous unchanged antigen. That the characteristics of the mucoid forms are more or less stable was shown by the fact that many test strains have remained inagglutinable after 15 or 20 transfers at 48 to 72 hour intervals. . . . A distinct capsule could be demonstrated on all mucoid forms by the use of the India ink method."

Of 174 human blood samples from suspected cases of undulant fever received for *B. abortus* diagnosis, 30 agglutinated *B. abortus* antigens in dilution of 1:100, 35 in dilutions of 1:50, and 40 in dilutions of 1:25. Only those samples showing agglutination in dilutions of 1:100 and higher were considered positive.

In a comparative study of the intradermal tests and the agglutination method with and without modifications for white diarrhea, several agglutination and two intradermal tests were conducted on about 90 and 70 adult chickens, respectively, of known history (both positive and negative). In both experiments the agglutination tests, run on the same individual birds at different times, were in close agreement with each other and with the post-mortem observations. The results obtained by the wattle tests, in which two different commercial brands of pullorin were employed, were quite irregular and unsatisfactory.

[Contributions on diseases and parasites of livestock in the Far East] (*Far East. Assoc. Trop. Med., Trans. 7. Cong., Brit. India, 1927, vol. 3, pp. 592–717, pls. 9*).—The contributions relating to livestock diseases and parasites include the following: Animal Infectious Diseases and Their Control in Japan, by N. Nakamura (pp. 592–596); Bovine Tuberculosis in India, by J. T. Edwards (pp. 598–602); Virulence of Tubercle Bacilli Isolated from Cattle in India, by M. B. Soparkar (pp. 603–627); An Improved Vaccine for Immunization against Rinderpest, by R. A. Kelser, S. Youngberg, and T. Topacio (pp. 628–645) (E. S. R., 60, p. 869); The Treatment of Canine Piroplasmosis, by R. F. Stirling (pp. 647–650); On the Morphology of the Virus of Contagious Peripneumonia of Cattle, by T. Taniguchi (pp. 654, 655); Generalized Infection of *Coenurus serialis* or *Multiceps gaigerii* in Goats, by D. Dey (pp. 656, 657); Rhinosporidiosis in Cattle: A Case Recorded in a Bullock, by V. K. Ayyar (pp. 658–664); Gastro-Enteritis Haemorrhagica in the Cattle of Formosan Milkers, by T. Miyamoto, T. Nomura, and S. Ono (pp. 665, 666); Urocystitis Haemorrhagica of Native Cattle in Formosa (pp. 667–685) and Strongyloidosis Intestinalis in the Farrow of Formosa (pp. 686–698), both by T. Miyamoto; and Rinderpest: Some Properties of the Virus and Further Indications for Its Employment in the Serum-Simultaneous Method of Protective Inoculation (pp. 699–706); and Rinderpest: Some Points in Immunity (pp. 707–717), both by J. T. Edwards.

Fifteenth annual report of the director of veterinary services, I, II, P. J. du Toit et al. (*Union So. Africa Dept. Agr., Ann. Rpt. Dir. Vet. Serv., 15 (1929), I, pp. XIV+573, figs. 260; II, pp. IV+575–1209, figs. 328*).—In volume 1 of this annual report (E. S. R., 60, p. 573) the contributions presented under the headings of protozoal diseases, virus diseases, bacterial diseases, and parasitology are as follows: A Note on the Diagnosis of *Trypanosoma vivax* Infection, by P. J. du Toit (pp. 3–8); The Relation of the Spleen to Immunity in Bovine Piroplasmosis, by G. de Kock (pp. 9–14); The Transmission of East Coast Fever by Means of Blood, by A. Theiler and P. J. du Toit (pp. 15–31); Dipping as a Method of Eradicating East Coast Fever, by P. J. du Toit and P. R. Viljoen (pp. 33–66); The Nature and Duration of the Immunity against Bluetongue in Sheep (pp. 69–78) and Studies on the Virus of Bluetongue (pp. 79–93), both by P. J. du Toit; Notes on Botulism in the Domesticated Animals (pp. 97–110), Notes on a Few Outbreaks of Botulism in Domesticated Animals and Birds (pp. 111–117), and A Note on *Corynebacterium ovis* (Bacillus of Preisz Nocard) (pp. 119–121), all by E. M. Robinson; The Preparation of Contagious Abortion Vaccine on Solid Media, by C. P. Neser (pp. 123–127); Studies on Anthrax Immunity, by J. I. Quin (pp. 129–182); The Relation of the Virulence of Attenuated Anthrax Strains to Their Immunizing Value, by J. G. Bekker (pp. 183–191); Immunization against Anaerobes of the Gas-Gangrene Type in South Africa by Means of "Anatoxins," by W. J. B. Green (pp. 193–221); A Note on Investigations into the Distribution of the Lamsiekte Organism (*Cl[ostridium] parabotulinum* C Type), by J. R. Scheuber (pp. 223–226); A More Refined Method of Bleeding Birds to Obtain Serum for the Agglutination Test for Bacillary White Diarrhoea, by R. A. Alexander (pp. 227–231); Diseases of Domesticated Animals in South Africa Due to Organisms of the Salmonella Group, by G. Martinaglia (pp. 233–295); The "Guinea Worm" of the Ostrich, *Contortospiculum spicularia* (pp. 299–302), *Hypodontus macropi* n. gen., n. sp., a Hookworm of the Kangaroo (pp. 303–306), *Filarinema flagrifer* n. gen., n. sp., a Trichostrongylid Parasite of the Kangaroo (pp. 307–310), *Agriostomum equidentatum* n. sp., a Hookworm of the Springbuck (pp. 311–316), Investigations into the Life-History of the Tapeworm *Moniezia expansa* (pp. 317–327), and *Physaloptera canis* n. sp., a New Nematode Parasite of the Dog (pp. 329–333), all by H. O. Mönnig; On the Morphology of a Schistosome (*Schistosoma mattheei* sp. nov.) from the Sheep in the Cape Province, by F. Veglia and P. L. le Roux (pp. 335–346) ; Remarks on the Habits and the Pathogenesis of *Schistosoma mattheei*, together with Notes on the Pathological Lesions Observed in Infested Sheep (pp. 347–406), Notes on the Life-Cycle of *Schistosoma mattheei* and Observations on the Control and Eradication of Schistosomiasis in Man and Animals (pp. 407–438), Two Species of Haemonchus Cobb, 1898, Parasitizing the Camel in the Cape Province (pp. 439–450), A Preliminary Report on Three New Members of the Genus Haemonchus Cobb, 1898, from Antelopes in South Africa (pp. 451–463), On an Oesophagostome (*Oesophagostomum susannae* sp. nov.) from the Springhare (*Pedetes caffra*), together with Remarks on Closely Related Species (pp. 465–479), and On a Hookworm (*Agriostomum gorgonis* sp. nov.) from the Blue Wildebeest (*Gorgon taurinus*) in the Transvaal (pp. 481–491), all by P. L. le Roux; and Notes on Some South African Ticks, with Descriptions of Three New Species (pp. 493–499), Anoplura (Siphunculata and Mallophaga) from South African Hosts (pp. 501–549), and The Effect upon Ticks of Dipping Cattle Regularly at Short Intervals in Arsenical Baths (pp. 551–573), all by G. A. H. Bedford.

In volume 2 the following contributions are presented under the headings of pathology, diseases due to poisonous plants, sterility, mineral deficiency, and miscellaneous: Haemo-lymphoid-like Nodules in the Liver of Ruminants a Few Years after Splenectomy (pp. 577–610), Are the Lesions of Jaagsiekte in Sheep of the Nature of a Neoplasm? (pp. 611–641), and Pathology of Phenol Poisoning in Sheep Induced by Certain Dips (pp. 643–656), all by G. de Kock; A Note on the Symptomatology of Phenol Poisoning in Sheep Induced by Certain Dips, by D. G. Steyn (pp. 657, 658) ; Skin Cancer of the Angora Goat in South Africa, by A. D. Thomas (pp. 659–761) ; Further Investigations into Geeldikkop (*Tribulosis ovis*) (pp. 765–767) and The Toxic Properties of *Cucumis myriocarpus* Naud. and *Cucumis africanus* Linn. (pp. 769–775), both by J. I. Quin; Recent Investigations into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa, by D. G. Steyn (pp. 777–803) ; Vlei Poisoning, I, by C. P. Neser (pp. 805–814), II, by A. O. D. Mogg (pp. 815–830) ; Researches into Sterility of Cows in South Africa, by J. Quinlan (pp. 833–1055) ; The Breeding of Cattle on Phosphorus Deficient Veld, by P. J. du Toit and J. H. R. Bisschop (pp. 1059–1166) ; Further Observations on the Etiology of Jaagsiekte in Sheep, by G. de Kock (pp. 1169–1183) ; Anatomical Studies No. 7: Hypoplasia of a Testicle and Hyperplasia of the Prostate in a Dog, by H. H. Curson (pp. 1185–1188) ; On the Toxicity of Arsenic to Fowls, by J. P. van Zyl (pp. 1189–1202) ; and A Clinical Case: Spasm of the Diaphragm in a Horse (pp. 1203, 1204) and The Intra-abomasal Administration of Drugs to Sheep (pp. 1205–1209), both by B. S. Parkin.

The toxic constituent of rayless goldenrod, J. F. Couch (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 7, pp. 649–658*).—Chemical studies of rayless goldenrod or jimmy weed (*Aplopappus heterophyllus*), which causes trembles, known locally as alkali disease, in certain sections of western Texas, New Mexico, and Arizona, are reported upon.

"The disease as it occurs in these places is clinically indistinguishable from trembles that occurs in the Central States, although in the latter locality the causative plant is richweed or white snakeroot (*Eupatorium urticaefolium*).

Tremetol, $C_{16}H_{22}O_3$, is the toxic constituent of rayless goldenrod. This compound was first isolated from richweed and is the substance in richweed that causes trembles in animals and milk-sickness in man. Dried rayless goldenrod appears to lose its toxicity slowly. The process is much less rapid than is the case with richweed. Animals poisoned on rayless goldenrod develop a ketosis, excrete acetone, become hyperglucemic, and in all respects resemble those poisoned on richweed."

[Work with infectious abortion at the Georgia Station] (*Georgia Sta. Rpt. 1929, p. 15*).—In attempting to determine the length of time that a pasture remains infected after abortion-infected cows have been removed therefrom, uninfected heifers from 12 to 18 months of age were placed on such a pasture 4 weeks later, in October, and kept there for several weeks, during which time the weather was warm, fair, and dry. None became infected, the results indicating that under the conditions of the test the abortion organism does not survive for as long as 4 weeks. Checked by cultures of the organism on agar plates kept exposed to the same weather conditions, no living organisms were found on the plates 4 weeks after exposure. The results obtained in the plate tests are probably not conclusive, as the organism might remain alive for longer periods on soils not exposed to the sun's rays.

Tick fever, J. R. MOHLER (*U. S. Dept. Agr., Farmers' Bul. 1625 (1930), pp. II+30, figs. 5*).—The present bulletin is a revision of and supersedes Farmers' Bulletin 569, previously noted (E. S. R., 30, p. 884).

[Parasites of cattle in the Virgin Islands], G. A. ROBERTS (*Virgin Islands Sta. Rpt. 1929, p. 6*).—Reference is made to the finding of many stomach worms (*Haemonchus contortus*) in the fourth stomach, a few nodular worms (*Oesophagostomum radiatum*) in the small intestine, and a few whipworms, probably *Trichuris ovis*, in the large intestine of a purebred calf which had been in thin flesh for some time and succumbed at the station.

Tuberculosis of cattle (*Wyoming Sta. Rpt. 1929, pp. 27, 28*).—Work with 32 skin lesions clearly indicated that they are truly tuberculous, although the organism is much less active than those ordinarily found in tuberculous cattle. In the course of the experimental work 7 of 10 rabbits inoculated from the skin lesions succumbed, and post-mortem examinations showed that they were tubercular. An account of the work by Elder, Lee, and Phelps has been noted (E. S. R., 61, p. 873).

Vaccination of calves against tuberculosis with Calmette-Guérin culture, BCG, C. M. HARING, J. TRAUM, F. M. HAYES, and B. S. HENRY (*Hilgardia [California Sta.], 4 (1930), No. 12, pp. 307–394, figs. 18*).—The present report includes a summary of experiments with the Calmette-Guérin (B. C. G.) culture, a report of the investigations of the station to date, and an account of the attempt to control tuberculosis by means of culture B. C. G. in a commercial dairy herd, together with summaries and conclusions drawn from the work in the State, and a review of the literature with a list of 80 references.

"The subcutaneous vaccination of cattle with 100-mg. doses of B. C. G. conferred sufficient resistance to protect against the fatal effects of intravenous or subcutaneous injections of virulent tubercle bacilli. In feeding trials with virulent tubercle bacilli, the vaccinated cattle showed less extensive lesions, as a rule, than the unvaccinated. The prolongation of the feeding of calves with massive doses of virulent tubercle bacilli apparently had no effect in increasing the number or size of the tuberculous lesions found on autopsy 4 to 12 months later. The calves which received from 2 to 10 infecting feedings had just as extensive lesions, on the whole, as those animals which were fed from 20 to 26 additional doses of much larger numbers of virulent tubercle bacilli. This was observed in both the vaccinated and nonvaccinated groups. Feeding infection experiments with calves following the intradermic, intravenous, or oral administration of B. C. G. indicated that these methods of vaccination are not superior to the subcutaneous.

"The resistance afforded by the vaccine was not sufficient to always prevent the penetration of the walls of the alimentary tract by virulent tubercle bacilli. In most cases this induced a caseation of the cervical and mesenteric lymph nodes. The chief protective effect of B. C. G. seems to be in retarding the extension of tuberculous processes occurring from infection received subsequent to vaccination. Apparently the subcutaneous method of vaccination has furnished protection against the development of clinical cases of tuberculosis in heifers in a tuberculous dairy herd. The nonprogressive tuberculous changes or the local vaccination lesions, or both, will render the majority of vaccinated cattle hypersensitive for a time to the intradermal injection of tuberculin, making such animals temporarily unmarketable in California except for beef. B. C. G. appears to be somewhat effective in protecting against a fatal termination of massive infection.

"The resistance to tuberculosis conferred by subcutaneous, intravenous, intradermic, or oral methods of administration of B. C. G., as used at the . . . station, is not sufficient to justify the use of the vaccine on cattle where measures designed to eradicate tuberculosis in cattle are being successfully carried out. On the other hand, in countries or localities where control measures are proving ineffective or where eradication seems to be hopeless for many years in the future, the vaccine may eventually be found of economic value to cattle owners by preventing the occurrence of extensive or fatal lesions and by limiting the spread of the disease.

"Observations of the effect of B. C. G. in cattle, swine, rabbits, and guinea pigs at the . . . station have thus far failed to detect the production of any lesions which could be proved to be virulent by reinoculation."

Studies on porcine infectious abortion, R. GRAHAM, I. B. BOUGHTON, and E. A. TUNNICLIFF (*Illinois Sta. Bul. 343 (1930), pp. 177–240, figs. 24*).—Following an introduction and a review of the literature, the studies reported upon, presented in large part in tabular form, deal with porcine abortion traceable to different causes; the spread of infectious porcine abortion; and the infective character of the porcine type or species (*Brucella suis*), considered under the headings of the antigenic value of live and dead cultures, infected boars potential spreaders, relation of *B. abortus* and *B. suis*, normally farrowing sows as carriers of *B. suis*, location of *B. suis* in infected animals, and monthly agglutination tests of vaccinated and unvaccinated pigs.

Field evidence of a convincing character has failed to show that abortion disease in cattle spreads to swine, and by experimentally exposing swine this supposition was not materially altered. On the other hand, the susceptibility of a pregnant heifer, as judged by abortion and positive agglutination test, suggests the danger of *B. suis* invading cattle.

Gilts suffering from infectious abortion may, with few exceptions, continue to react to the agglutination test but farrow normally in subsequent pregnancies. Abortion in healthy gilts or sows may occur following the feeding of the porcine abortion organism, but some pregnant sows and gilts following exposure may farrow normally. A positive agglutination reaction was consistently observed in healthy gilts and sows following the injection or feeding of *B. suis*. Males, including barrows, react the same as gilts. Cows, horses, guinea pigs, and rabbits may be artificially infected, as judged by the agglutination test. Young pigs are highly resistant, as judged by the mild response and rapid decline of the agglutination titer following exposure. The infection may persist, however, in young pigs for several weeks.

The porcine type of Brucella organism resembles the bovine strain morphologically and serologically, but can generally be distinguished by its luxuriant growth and yellow pigment in old agar cultures. Experimental infection of a heifer by intravenous injection with porcine strains was followed by abortion. Field observations and exposure of pigs by feeding naturally and artificially infected cow's milk fail to provide definite proof that *B. abortus* of cattle is a common etiologic factor in infectious abortion in swine. In normally farrowing sows in one spontaneously infected herd *B. suis* could not be demonstrated in the afterbirth or dead fetuses, yet emulsions of these tissues following subcutaneous injection into guinea pigs occasionally produced in these animals specific agglutinins for *B. suis*. Since the blood sera or colostra in nine of the sows at the time of farrowing completely agglutinated *B. suis* in a dilution of 0.01 to 0.02, the passive transmission of agglutinins by the material injected into guinea pigs seems probable.

Direct cultures of the nonlactating mammary glands of sows reacting positively to the agglutination test failed to yield *B. suis*. Negative results were also obtained by inoculating guinea pigs with emulsions of the mammary tissue. Occasionally the guinea pigs inoculated with the mammary gland emulsion developed specific agglutinins for *B. suis*. *B. suis* was present in the testicular tissue of young pigs 14 to 45 days after artificial exposure by feeding or intravenous injection. The pigs yielding positive cultures showed slight or no agglutinins to *B. suis*. No gross pathologic lesions in testes harboring *B. suis* were observed in young pigs experimentally infected.

B. suis was demonstrated in the epididymi of pigs 14 to 16 days after feeding the organism. The agglutinins in the blood serum of pigs were slight or imperceptible. Gross lesions were not observed in the epididymi yielding positive cultures. *B. suis* was encountered in the bulbo-urethral glands and seminal vesicles of an actively breeding boar 17 months after the feeding of the organism. Such findings suggest that males harboring the infection in the reproductive organs might play an active part in the spread of the disease at the time of breeding. The body and visceral lymphatic glands and spleen of young pigs artificially infected by feeding yielded positive evidence of *B. suis* from 30 to 80 days later. The agglutinin titer for *B. suis* in the blood sera of these pigs was not characteristic of the infection.

The nongravid uteri and ovaries of sows harbored *S. suis* for a period of from 6 to 20 months following subcutaneous or intravaginal injection. Other animals that yielded positive uterine or ovarian cultures were exposed by feeding or by association with infected animals. The frequency of a uterine or ovarian infection was not determined, but in the animals at the authors' disposal the nongravid uteri frequently harbored the infection. The colostrum in aborting and normally farrowing infected sows also yielded *B. suis*.

Pigs from 10 to 12 weeks old injected subcutaneously with *B. suis* vaccine showed a low average agglutination reaction extending over a period of approximately 6 months, followed by a secondary curve of shorter duration lasting approximately 2 months. Uninoculated control pigs in the same pen showed a comparable average primary and secondary agglutination curve with comparable maximum titer to *B. suis*. The average maximum agglutination titer of the vaccinated pigs preceded the maximum agglutination reaction of the contact control or unvaccinated pigs approximately 90 days.

Unvaccinated pigs which were allowed continuous association with pigs of the same age that received live vaccine are thought to have contracted abortion infection through association. This suggests the importance of segregation of vaccinated pigs. None of the 24 pigs vaccinated at weaning aborted, nor was evidence regarding the danger of abortion carriers in the pigs injected with living culture vaccine found in fetal membranes and dead fetuses of pigs vaccinated at the time the first litters were born. Direct cultures and guinea pig inoculations were negative. The vaccinated gilts also gave a negative agglutination test at the time of farrowing, 9 months following vaccination.

A list is given of 32 references to the literature.

Spirochetes as the etiological factor in certain specific necroses and hyperplastic formations in swine, J. A. Howarth (*Hilgardia* [*California Sta.*], *4* (*1930*), *No. 13*, *pp. 395–413*, *figs. 9*).—The author has found spirochetes to be present in all tissue specimens of scirrhous cord and rhinohyperplasia. They are readily demonstrated in the discharge from these conditions when stained with carbol-fuchsin and Giemsa's stains. In the tissue preparations, stained by Levaditi's and Warthin's methods, the spirochetes were observed close to the line of necrosis in the hyperplastic tissue.

"*Bacillus subtilis* and *Staphylococcus pyogenes albus* were also always present in the discharge, and a Gram-negative bacillus was found occasionally, which, when cultured, seemed to grow in symbiosis with *B. subtilis*. *B. necrophorus* was isolated from three cases of rhinohyperplasia, and the organisms were associated in each case with spirochetes. As a result of the observations and experimental work, the conclusion seems justified that the presence of spirochetes in every case indicates that they are the etiological factor in these hyperplastic growths and the *B. necrophorus* a secondary invader.

"The spirochete has not been cultivated in pure culture. The spirochetes are located more deeply in the lesions than the other organisms, this fact suggesting their pathogenic influence and etiological relationship in the production of scirrhous cord and rhinohyperplasia. Scirrhous cord and rhinohyperplasia could not be experimentally reproduced by injection of the pure cultures or pooled cultures of organisms other than spirochetes isolated from these lesions. When, however, the mixed cultures containing the spirochetes were injected the diseases were readily reproduced.

"The inoculations of pure cultures of *B. necrophorus* into healthy pigs did not produce lesions similar to those obtained by the inoculation of tissue containing spirochetes. Work done heretofore on the effect of light rays and restricted nutritional régimes on skeletal deformities of hogs has effectively eliminated the supposition that rhinohyperplasia is caused by or constitutes a complication of rachitis in swine. Antimony and potassium tartrate (tartar emetic) was tried as a therapeutic agent with about 90 per cent recoveries, but precautions were necessary to prevent poisoning from absorption because of too large amounts placed in the incised growths."

Two new species of nodular worms (Oesophagostomum) parasitic in the intestine of domestic swine, B. Schwartz and J. E. Alicata (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 6*, *pp. 517–522*, *figs. 12*).—Detailed descriptions are given of two new nodular worms that occur in the large intentine of domestic swine, namely, *O. brevicaudum* and *O. georgianum*, both taken at Moultrie, Ga., the former in large numbers.

The rapid agglutination test with fresh whole blood for the detection of fowls that are carriers of Bacterium pullorum, J. R. Beach and S. T. Michael (*California Sta. Bul. 486* (*1930*), *pp. 18–23*, *fig. 1*; *also in North Amer. Vet.*, *11* (*1930*), *No. 2*, *pp. 43–46*, *figs. 2*).—In this account, which forms a part of the bulletin previously noted (E. S. R., 63, p. 77), the authors record the results of work with the rapid agglutination test with fresh whole blood for the detection of pullorum disease devised by Bunyea, Hall, and Dorset (E. S. R., 62, p. 670), 3,727 fowls having been used.

In addition to the drop of blood film, use was also made of blood left in the form of a drop to which an equal quantity of antigen was added and the mixture stirred. The reactions where the drop was used occurred promptly, and were just as definite and as easily read as those of tests made with a blood film or by the rapid serum agglutination method in the preliminary trials. Trials with farm flocks, summarized in tabular form, showed that of 435 fowls that reacted to the slow test 57.5 per cent reacted to the blooddrop test and 39.9 per cent to the blood film test. It is pointed out that the number of reactors to the blooddrop and blood film tests would have been decreased by 30 and 24, respectively, had only those reactions been recorded that occurred within 3 minutes.

Analysis of data not included in the table shows that of 78 fowls that were positive to the slow serum and blooddrop test but negative to the blood film test 48 gave a reaction in either the first three or all four dilutions and 28 gave a reaction in only the first one or two dilutions of the slow serum test. Of 185 fowls that were positive to the slow serum test and negative to both the blooddrop and film tests, 69 gave a reaction in the first three or all four dilutions and 116 gave a reaction in only the first one or two dilutions of the slow serum test. The fowls that reacted to the slow serum test and not to the fresh blood test or that reacted to the blooddrop and not to the blood film test were not confined to those that gave a positive reaction in only the 1:25 or 1:50 dilutions of the slow serum test.

The pathogenicity of the species of the genus Brucella for the fowl, I. F. Huddleson and M. W. Emmel (*Michigan Sta. Tech. Bul. 103* (*1929*), *pp. 30, figs. 9*).—The details are given of experiments conducted, of which preliminary accounts have been noted (E. S. R., 61, p. 875; 62, p. 471).

Work with 48 birds of several breeds has demonstrated that the species *Brucella melitensis*, *B. abortus*, and *B. suis* produce a disease of chronic nature which nearly always has a fatal termination in the birds. It was found that the agglutination test is a reliable method for determining the presence of the disease in a flock, but that it can not be depended upon as an indicator of infection in individual birds. "The isolation of the species of the organism in question is difficult to accomplish. There appears to be no certain period during the course of infection in which the organism can be regularly isolated. The microscopic study of the tissues of 33 birds has shown these definite lesions: Perivascular foci of hyperplasia in the spleen, perivascular foci in conjunction with the interlobular vessels of the liver and hydropic degeneration of the parenchymal cells of the liver, cloudy swelling and necrosis of tubular epithelium of the kidneys, and peribronchiolar lesions in the lungs. Further, the disease has been found to exist in naturally infected flocks. Fourteen birds obtained from two of these flocks reacted to the agglutination test and showed typical microscopic lesions.

"Although the disease is not necessarily fatal, it may be of considerable economic importance due to the greatly decreased egg yield of the infected birds."

Tuberculosis of fowls, R. Graham and F. Thorp, jr. (*Illinois Sta. Circ. 354* (*1930*), *pp. 11, figs. 9*).—A practical summary of information on the disease.

Use of anthelmintics for intestinal parasites [of poultry], F. B. L. Guerrero (*Guam Sta. Rpt. 1928, pp. 10–13, fig. 1*).—Tests made with freshly ground betel nut (*Areca catechu*), freshly ground papaya seed (*Carica papaya*), and carbon tetrachloride thoroughly mixed with fresh coconut oil are reported upon. These trials led to the conclusion that freshly ground betel nut is the least satisfactory of the three, and that carbon tetrachloride in coconut oil administered after a short fasting period is efficacious for ascarids and in some instances is of considerable benefit against tapeworms.

AGRICULTURAL ENGINEERING

Engineering experiment station record: A summary of engineering research at the land-grant colleges and universities, edited by R. A. Seaton (*[Manhattan, Kans.]: Assoc. Land-Grant Cols. and Univs., Engin. Expt. Sta. Com., 1929, pp. VII+98*).—This volume is a revised edition of a summary and record of engineering research published by the association in 1923. It contains a complete list of the research bulletins and circulars that have been published by the engineering divisions of the land-grant colleges and universities, and also a list of research projects that are in progress.

A statistical summary of the data presented indicates that there are 38 engineering experiment stations, which have issued 1,263 bulletins and circulars. The funds available to these experiment stations for the fiscal year 1928–29 totaled $1,440,018, of which $153,990 was appropriated by the legislatures, $527,-403 was allotted by the institutions themselves, and $758,625 was received from other sources. The personnel for this period consisted of 278 full-time employees, 392 part-time employees, and 255 employees who worked part time without extra pay.

[Agricultural engineering bibliographies] (*Internatl. Rev. Agr. [Rome], Mo. Bul. Agr. Sci. and Pract., 20 (1929), Nos. 6, pp. 237–240, fig. 1; 10, pp. 406–409*).—The first of these bibliographies of for the most part foreign work in agricultural engineering deals with drainage, motors, tractors, cable plows, grain cleaning, tillage of hoed crops, cotton pickers, and rural sanitation. The second deals with drainage, irrigation, tractors, tillage, planting and harvesting machinery, threshers, dairy machinery, and farm wagons.

The duty of water for rice irrigation on the Grand Prairie of Arkansas, B. S. Clayton (*Rice Jour., 33 (1930), No. 2, pp. 18, 24, 25*).—This is a contribution from the division of agricultural engineering of the U. S. D. A. Bureau of Public Roads, dealing with investigations made in cooperation with the Arkansas Experiment Station relating to the duty of water for rice irrigation.

The data presented indicate that from 24 to 30 in. of water are required to raise a crop of rice, depending in each case on the proportion of early and late varieties and also to some extent on the number of continuous seasons that the fields have been planted to rice. Continuous planting encourages the growth of water grasses, which in turn make necessary a greater depth of water to check their growth.

The conclusion is also drawn that a well should have a capacity of from 5 to 6 gal. per minute for each acre irrigated, depending on the variety of rice and the condition of the land. Where the land is rather level, the subsoil impervious, and the water used in an economical manner, a well capacity of 5 gal. per minute will suffice.

With reference to the possibility of storing surface waters in reservoirs for rice irrigation, the data suggest that a storage of 2 acre-ft. for each acre irrigated will be adequate.

Rice irrigation on the Grand Prairie of Arkansas, B. S. Clayton (*Agr. Engin., 11 (1930), No. 3, pp. 110–112, figs. 4*).—Noted above.

Seasoning, handling, and care of lumber (manufacturers' edition) (*Washington: U. S. Dept. Com., Natl. Com. Wood Util., 1929, pp. VIII+126, figs. 63*).—This report of the manufacturers' subcommittee of the National

Committee on Wood Utilization, prepared by A. B. Cone, points out various methods of producing properly seasoned lumber, and discusses yard layouts, methods of handling, and yard seasoning.

Depression of the wet bulb for control of the dry kiln, H. D. TIEMANN (*South. Lumberman, 138 (1930), No. 1774, pp. 56, 58, figs. 2*).—Experiments conducted by the U. S. D. A. Forest Products Laboratory are reported on the relation of the depression of the wet bulb to the moisture equilibrium condition of the surface of wood. The conclusion is drawn that this relation offers a practical solution of the problem, it having already been advantageously applied to commercial operations. The method makes apparent at a glance the comparative severity of drying conditions except for the effect of excessive temperature, and provides a means of controlling the drying conditions that is independent of minor temperature fluctuations. It also provides a means of identifying and controlling the severity of conditions when wide changes in temperature are occurring.

The effect of clay as an admixture in concrete, A. N. VANDERLIP and H. H. SCOFIELD (*Cornell Civ. Engin., 38 (1930), No. 5, pp. 104–108, 119, figs. 6*).—This is a preliminary report of experiments in progress at Cornell University. Tests are being made on 4 series of concretes at ages of 60 days, 6 months, 1 year, and 2 years. The present report covers the results of the 60-day and 6-month periods only.

It was found that, within the range of the tests, the strength of the resulting concrete is reduced by replacing 10 per cent of the cement by an approximately equal weight of clay. At the 180-day age especially, the strength of specimens stored in comparatively dry air was considerably less than that of water-cured specimens. This indicates the value of keeping concrete moist during curing, and also suggests that the alternate freezing and thawing of concrete that has previously been cured under favorable conditions has little effect upon the strength of the concrete.

The modulus of elasticity at 800 lbs, per square inch stress is reduced by replacing 10 per cent of the cement with clay.

The results of the permeability tests under water pressure appear to indicate that 10 per cent of clay decreases considerably the permeation of water into and through the concrete in the leaner 5-bag batch concrete, but substantially increases the permeation in the case of the richer 6-bag batch concrete. In some cases a plugging action of the clay was noted.

A partial bibliography is included.

The use of calcium chloride or sodium chloride as a protection for mortar or concrete against frost, W. N. THOMAS (*[Gt. Brit.] Dept. Sci. and Indus. Research, Bldg. Research, Spec. Rpt. 14 (1929), pp. IV–30*).—Studies are reported which showed that both calcium chloride and sodium chloride, when added in suitable proportions to the mixing water of a Portland cement mortar or concrete, afford protection against a limited degree of frost during the early setting and hardening periods. Sodium chloride is liable to cause efflorescences on the face of the concrete, and calcium chloride tends to produce discolorations.

Unless the concrete is very dense, the presence of commercial forms of both salts in reinforced construction is liable to cause corrosion of the reinforcing metal, and particularly to intensify that due to stray electric currents. It is considered inadvisable to use either salt for this purpose. Concrete to which sodium chloride is added appears to attain a considerably lower strength at long ages than similar concrete without this salt. It appears that the best proportions of calcium chloride to use are from 2 to 4 per cent of the anhydrous salt by weight. Certain experiments have shown, however, a decrease in strength, particularly of tensile strength, thus indicating that the employment of calcium chloride is attended with some risk.

A bibliography is included.

A study of the Ikeda short-time (electrical resistance) test for fatigue strength of metals, H. F. MOORE and S. KONZO (*Ill. Univ., Engin. Expt. Sta. Bul. 205 (1930), pp. 34, figs. 19*).—The Ikeda electrical resistance method for determining endurance limit under repeated stress was investigated in connection with reversed-flexure fatigue tests of Armco iron, 0.2 carbon steel, 0.52 carbon steel, hardened tool steel, brass, monel metal, and copper.

The results showed a fair coincidence between the endurance limit as determined by the Ikeda test and by an ordinary long-time fatigue test. In general the Ikeda test gave results on the safe side. The tests also gave evidence that the total change in the electrical resistance of a metal subjected to repeated stress depends on (1) change of resistance due to change in temperature, and (2) change of resistance due to structural rearrangements within the metal.

For the ferrous metals tested the stress-resistance and the stress-temperature data were of the same general character, and it appears probable that the temperature effect is the dominant one. For the monel metal and copper tested up to the endurance limit, the resistance decreased as the stress increased, indicating that internal structural changes were more powerful in affecting resistance than the heating effect.

An appendix deals with a differential method of measuring changes in electrical resistance during a fatigue test.

Studies in the electrodeposition of metals, D. B. KEYES and S. SWANN, JR. (*Ill. Univ., Engin. Expt. Sta. Bul. 206 (1930), pp. 18*).—The results of studies on the electrodeposition of several different metals are reported.

The results indicate that the successful deposition of amphoteric metals must take place from highly ionized complex compounds. Aluminum was found to be the only metal which could be electrodeposited from the complex formed with tetraethyl ammonium bromide and its halide. It was found necessary to use the bromide for successful deposition of aluminum. Cerium, vanadium, chromium, and tungsten halides were found to form complexes only above the decomposition point of tetraethyl ammonium bromide on account of their high melting points.

An appendix deals with a method of electroplating small objects with aluminum.

Some experiences in industrialized farming, J. S. BIRD (*Agr. Engin., 11 (1930), No. 2, pp. 51–54, fig. 1*).—An account is given of experience in large-scale wheat farming, and considerable data are summarized and analyzed. They indicate that the cost of the major farm operations can be tremendously reduced by power equipment and management. Power machinery makes it possible to cover large areas quickly and cheaply by day and night operation, and production is thus increased and made more certain. However, it has been found that large-scale operation requires level or almost level lands and large fields.

Some fundamental factors determining the effective capacity of field machines, E. G. MCKIBBEN (*Agr. Engin., 11 (1930), No. 2, pp. 55–57, figs. 5*).—In a contribution from the Iowa Experiment Station the results of an analysis of the fundamental factors determining the effective capacity of field machines are presented. These indicate that the daily capacity of a field machine in acres can be approximated by multiplying its width in feet by its operating speed in miles per hour. As the length of a field is decreased the number of turns increases as the reciprocal of the length of the field, so that turns become a rather important cause of time loss in short fields. In short fields which are handled as lands, the idle travel across the ends represents a relatively large loss, especially where comparatively wide lands are used.

Interruptions which tend to be proportional to the area worked increase rapidly in importance as the capacity of the machine is increased. Thus if the operating speed is increased, the time for all routine interruptions must be decreased in the same ratio if the same percentage of the uninterrupted capacity is to be maintained. If the width is increased, the time required for all routine interruptions must not be allowed to increase if the same percentage of the uninterrupted capacity is to be maintained. As the capacity of field machines is increased the penalty for adverse field conditions, inferior construction, and careless operation and maintenance, and the reward for good land, superior construction, and efficient operation and maintenance increase.

Farm equipment in Illinois, J. L. Schram (*Chicago: Ill. Chamber Com., 1928, pp.* [7]).—Data gathered by the University of Illinois and the Illinois Cooperative Crop Reporting Service on farm equipment in the State are summarized and analyzed for the year 1928. The results are based upon the farm equipment situation on about 6,250 farms.

Organization of research in the adaptation of the general-purpose tractor, R. W. Trullinger (*Agr. Engin., 11* (*1930*), *No. 2, pp. 65–68, figs. 2*).—In a contribution from U. S. D. A. Office of Experiment Stations an analysis is given of the factors entering into the planning of general-purpose tractor research.

The general-purpose tractor in potato production in Pennsylvania, R. U. Blasingame and H. B. Josephson (*Agr. Engin., 11* (*1930*), *No. 2, pp. 58–60, figs. 8*).—In a contribution from the Pennsylvania Experiment Station the progress of investigations of the use of the general-purpose tractor in potato production is briefly summarized, no conclusions being drawn.

A critical glance at some aspects of tractor farming in Australia, A. J. Perkins (*So. Aust. Dept. Agr. Bul. 232* (*1929*), *pp. 12*).—The advantages and disadvantages of the tractor for use as agricultural power in Australia are discussed. It is pointed out that at the outset tractors are heavily handicapped by high initial costs and depreciation rates, and that on the average Australian farm fuel and oil are more costly than home-grown hay. The ability of the tractor to economize labor in the field and to improve average crop yields is questioned. Attention is drawn especially to the fact that tractors, fuel, and oil must be imported into Australia, whereas horses and feed are local products.

Recent progress in tractors (*Internatl. Rev. Agr.* [*Rome*], *Mo. Bul. Agr. Sci. and Pract., 20* (*1929*), *No. 9, pp. 359–365, figs. 4*).—Attention is drawn to the progress made in the development of wheel equipment, air cleaners, power take-off, use of low-grade fuels, and the development of tractors specifically adapted to the use of low-grade fuels. A list of references is included.

Recent improvements in machinery and implements for sugar beet cultivation (*Internatl. Rev. Agr.* [*Rome*], *Mo. Bul. Agr. Sci. and Pract., 20* (*1929*), *No. 2, pp. 78–80, figs. 5*).—Machinery for the preparation of soil and for the culture of sugar beets is briefly described. Nine references to European investigations on the subject are included.

Review of methods of testing insulating and building materials for heat transmission, F. G. Hechler and A. J. Wood (*Amer. Inst. Refrig. Proc., 17* (*1928*), *pp. 151–179, figs. 10*).—In a contribution from the Pennsylvania State College experimental methods are described for determining the amount of heat which will pass through a definite area of a material in a given time.

Heat transfer through insulating materials, M. S. VAN DUSEN and J. L. FINCK (*Amer. Inst. Refrig. Proc., 17 (1928), pp. 137–150, figs. 5*).—The results of tests conducted by the U. S. Bureau of Standards of the heat transfer through several of the newer insulating materials are reported, and the method of testing is described in detail.

With the exception of the gypsum products, the results indicate conductivity as a function of density, irrespective of material. As the density becomes very low the conductivity in general tends to approach a value varying very little with density. The materials giving this trend all consist of loosely packed fibers. The gypsum products follow a distinctly different trend, since the cell walls are practically continuous from one portion of the material to another and are composed of fairly good conducting material. The conductivity decreases rapidly with decreasing density. Air motion from one cell to another is evidently of negligible importance even with the lightest material.

All materials of the class considered contained a certain amount of hygroscopic water, tending to be in equilibrium with the relative humidity of the surrounding atmosphere and practically independent of the temperature. Ordinary changes in the humidity were found to change the normal moisture content by relatively small amounts and to produce insignificant or at least small changes in the thermal conductivity of the material. The observed large increases in the conductivity of slightly damp materials are considered to be due to evaporation of water during test and the consequent absorption of relatively large amounts of heat within the material. The results indicate that the effect on thermal conductivity is of the same order as the effect of changing the bulk density of the material the same amount by other means.

Thermal insulation of buildings (*U. S. Dept. Com., Bur. Standards Circ. 376 (1929), pp. 11, figs. 2*).—This circular is a brief nontechnical discussion of the principles of heat transfer as applied to thermal insulation at ordinary temperature, particularly with reference to buildings. The insulating properties of a number of general classes of insulating and building materials are given, together with estimates of the probable fuel savings resulting from the use of such materials.

The application of refrigeration to dairying in the United States of America, J. T. BOWEN (*Amer. Inst. Refrig. Proc., 17 (1928), pp. 196–231, figs. 23*).—In a contribution from the division of agricultural engineering of the U. S. D. A. Bureau of Public Roads, an extended summary account is given of findings relating to dairy refrigeration.

Sewerage, A. P. FOLWELL (*New York: John Wiley & Sons; London: Chapman & Hall, 1929, 10. ed., rewritten, pp. X+399, figs. [128]*).—This is the tenth revised edition of this book. It deals with the designing, constructing, and maintaining of sewerage systems and sewage treatment plants.

RURAL ECONOMICS AND SOCIOLOGY

Abandoned farm areas in New York, L. M. VAUGHAN (*New York Cornell Sta. Bul. 490 (1929), pp. 285, figs. 23*).—This study continues that previously noted (E. S. R., 61, p. 884). Detailed information was gathered during 1926, 1927, and 1928 regarding 13 areas comprising 154,784 acres in 10 counties. Data were also obtained during 1927 and 1928 concerning the use and condition of buildings and the use of land along the roadside in 27 additional areas comprising about 392,400 acres. Each of the areas studied in detail is described and the data for each analyzed and discussed under the following headings: Livestock, machinery, real estate, condition of buildings, the people, absentee owners, utilization of the land, farm operations, taxation, and the contribution of the agriculture of the area.

The detailed study of the 13 areas and the 2 areas previously studied showed the following facts: There were 685 occupied farms, 764 vacant farms, and 329 parcels of land. Of the vacant farms, 47 per cent had been vacant for 10 years or more. About 25 per cent of the occupied farms were not operated. Of the occupied land, 2 per cent was in farmsteads, 14 in hay, 6 in other crops, 18 in pasture, 25 idle land, and 35 per cent in woods.

The average farm income, including outside work (11 areas), varied from $86 to $517, averaging $339; interest on capital from $167 to $310, averaging $241; and labor income from —$119 to $292, averaging $98. The net agricultural contribution per acre of cleared land (10 areas) varied from 87 cts. to $6.75, averaging $3.21, and taxes (14 areas) from 22 to 62 cts. per acre, averaging 34 cts. per acre.

How the land can be brought into use is discussed, special attention being given to the possibilities of a forestry program.

[Cost of production of milk for the Casper market] (*Wyoming Sta. Rpt. 1929, pp. 9, 10*).—A study made by O. A. Negaard in 1928 of 12 dairies near Casper showed the following averages: Annual cost per cow $231.44, income per cow $212.50, production of milk 6,967 lbs., cost per 100 lbs. of milk $3.31, and price paid by distributors per 100 lbs. of milk $3.05. For 16 dairies in the Douglas area the average production per cow was 6,153 lbs., and the average cost per 100 lbs. of milk $2.49. The average loss was 2 cts. per 100 lbs. of milk.

Livestock truckage rates in Illinois, R. C. Ashby (*Illinois Sta. Bul. 342 (1930), pp. 117–175, figs. 22*).—This study is based upon records furnished by three commission firms, one each at Peoria, East St. Louis, and Chicago, for truck consignments during 1927 and December, 1928, and on railroad freight rates on stock shipped to these markets. The data used included 15,484 cattle and calves, 111,986 hogs, and 8,837 sheep received during 1927, being 7.2, 14.2, and 7.7 per cent, respectively, of the total 1927 truck receipts at the three markets. Tables are given showing by zones (0 to 15 miles and by 10-mile intervals thereabove) the railroad freight rates and the average truckage charges for the different kinds of livestock in 1927 and December, 1928.

The 1927 truckage rates per hundredweight per mile to the three markets were found to have exceeded the freight rates as follows: Cattle and calves 100 to 700 per cent, hogs 100 to 250 per cent, and sheep 60 to 350 per cent. On shipments moving 45 miles or more, the average apparent savings in marketing by rail instead of by truck (20 cts. per hundredweight added to freight rate for trucking charge from farm to loading point and for local shipping association home expenses) per head and per hundredweight, respectively, were for Peoria 53 and 20 cts., East St. Louis 57 and 25 cts., and Chicago 26 and 11 cts. Using the December, 1928, truckage rates, the apparent savings were for Peoria 38 and 14 cts., East St. Louis 44 and 19 cts., and Chicago 15 and 6 cts.

Various factors in the trucking problems are briefly discussed.

Current problems of Montana farmers' elevators, E. J. Bell, jr. (*Montana Sta. Bul. 226 (1930), pp. 48, figs. 3*).—This bulletin is based on a study, carried on in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of farmers' elevators in Montana for the crop years 1925–1927. Contact was made with 28 of approximately 50 such elevators in the State, copies of audit statements being obtained from audit companies, and data as to details of the business by annual visits to each elevator. The services rendered by cooperative elevators, the problems of handling wheat on a protein-content basis, hedging, storing of farmers' wheat, handling side-lines, and the handling of wheat from combines are discussed.

The average cost of handling grain by the elevators studied was 5.6 cts. per bushel in 1925, 6.7 cts. in 1926, and 3.6 cts. in 1927. The cost for individual elevators ranged from 1.5 to 20.4 cts. per bushel during the 3-year period. Curvilinear correlation of the data regarding the volume of grain handled and the cost per bushel of handling for 60 cases of the business of an elevator for one year gave a coefficient of —0.93. The curve fitted by least squares showed that the costs per bushel of handling different volumes of business were as follows: 20,000 bu. 18 cts., 100,000 bu. 6 cts., 200,000 bu. 3.75 cts., and 500,000 bu. 2 cts.

Marketing Willamette Valley wools through the Pacific Cooperative Wool Growers, E. B. Mittelman (*Oregon Sta. Bul. 260 (1930), pp. 15, figs. 4*).—The experience of the Pacific Cooperative Wool Growers in the valley since its organization in 1921, as it relates to the receipts and sales of wool and credit relations with the growers, is described. The study shows that, as a whole, the sales by the association have fallen near the high points of the Boston quotations or when the high points were in the making, and that from 1921 to 1927 76.1 per cent of the growers who had no loans remained with the organization as compared with 46.1 per cent of those who had loans.

Roadside marketing in New Hampshire, M. G. Eastman (*New Hampshire Sta. Bul. 249 (1929), pp. 39, figs. 12*).—A survey in 1927 along about 1,000 miles of highway showed 791 selling places on farms or in localities with such a semblance of farm conditions that they might be operated by farmers. These places are classified as follows: Merchandised products 367, overnight accommodations 145, tea room, gift shop, etc., 81, farm-grown products 77, dooryard sign only 55, gas and oil only 45, and homemade products 21. Detailed estimates of business were obtained from 103 places and estimates of sales from 104 other places.

The average annual sales for the 103 places were $2,714 and for the 207 places $1,878. Of the 103 places, 80 were organized from 1922 to 1927, inclusive, and 55 sold home-grown farm produce. The average total sales for the 55 places was $3,154, of which 31.1 per cent was from farm products raised, 7.8 from farm products purchased, 10.9 from home prepared food, 15.3 from purchased food, candy, etc., 29.7 from gasoline and oil, 1.7 from overnight accommodations, and 3.5 per cent from miscellaneous. The distribution of sales by months and days of the week, the labor required to operate stands, the location of stands, advertising, buildings, prices, and other phases of operation of stands are discussed.

Farm value, gross income, and cash income from farm production.—Part I, Estimates by commodities and by States, together with production, disposition, and price data used, 1924–1928: Sect. 1, Crops (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. [3]+190*).—This is a preliminary mimeographed report giving estimates, by commodities and States, 1924–1928, of the production, disposition, farm price, and farm value of and the gross income and cash income from different crops.

Estimated income from the Ohio agricultural industry, V. R. Wertz (*Ohio Sta. Bul. 450 (1930), pp. 37, figs. 2*).—Tables and graphs are presented and discussed for the period 1920–1928 showing the yearly and monthly totals and, by items, the estimated gross cash income (1910–1928), cash expenses, value of home-produced food and fuel consumed on farms, net cash income, sales and prices (1910–1928) of grains, tobacco, meat animals, livestock, and dairy and poultry products, and the value of fruits, vegetables, and miscellaneous farm products.

Crops and Markets, [March, 1930] (*U. S. Dept. Agr., Crops and Markets, 7 (1930), No. 3, pp. 81–112, figs. 2*).—The usual tables, graphs, reports, summaries, and notes are included, together with tables showing, by States, the farm stocks of different grains on March 1, 1930, the percentage of the last crop shipped out of the county where grown, and the percentage of the last corn crop of merchantable quality, and the changes in the number of persons living on farms in 1929, by geographic divisions.

Corn statistics (*U. S. Dept. Agr., Statis. Bul. 28 (1930), pp. 140*).—Statistics for the year ended December 31, 1928, with comparable data for earlier years, are included for acreage, production, farm value, and yield, total and by States; acreage, yield, and production in foreign countries; planting and harvesting dates; condition of crops; intentions to plant; standards; futures; marketing; inspections; receipts and shipments; stocks; supply and distribution; millings and grindings; freight rates; shrinkage; imports and exports; international trade; corn and hog ratios; and prices.

Cherries, H. R. Wellman and E. W. Braun (*California Sta. Bul. 488 (1930), pp. 38, figs. 17*).—Tables and charts are included and discussed showing the production of cherries in California and other western States; bearing acreage of cherries in California, by years 1914–1929, and the estimated acreage, 1930–1932; data for fresh cherries as to California production and shipments; sales by varieties, price trends, and price differentials between varieties; data as to the production of canning cherries in different States; trends of the canned cherry pack in California, 1909–1928, and in the western States, 1919–1928; prices paid to growers for canning cherries; exports of canned cherries; Maraschino cherries; and Italian exports and United States imports of cherries.

The genesis to farming occupations in Connecticut, J. L. Hypes and J. F. Markey (*Connecticut Storrs Sta. Bul. 161 (1929), pp. 381–549, figs. 20*).—This study is the first of a series the purpose of which is "to make an analysis of the origins, the movements, and the character of the rural population of the State of Connecticut, pointing these analyses toward educational ends." The present study, the data for which were obtained chiefly by field surveys in six towns during the spring, autumn, and winter of 1927–28, has for its "primary aim . . . to discover and describe important socio-economic groups in the rural population of the State as the essential foundation for further studies, and more specifically, to make a detailed analysis of the genesis to the more important types of farming occupations found in the State." The treatment of the data is largely statistical and analytical.

Chapter 2 (pp. 392–441) is devoted to a description of the general socio-economic backgrounds, the factors—farm type and soil type—used in selecting the areas, and the selection and classification of the cooperators, and a descriptive summary of each town selected for special study. Chapter 3 (pp. 442–456) deals with the origin of the cooperators according to farm types, previous farm experience in relation to farm-type continuity and the relation of nationality to experience in beginning and present types of farming, and the supplementary occupational employment. Chapter 4 (pp. 457–481) presents the findings as to the types of climbers on the agricultural ladder and the influence of types of farming on gaining vocational responsibility. Chapter 5 (pp. 482–528) considers the findings as to the trends in vocational stability, including the different types of moves, the effect of types of farming, nationality, and kinship, reasons for shifts, and the interrelationship of different variables.

The ages of the cooperators were found to vary considerably between different nationalities, experience on the agricultural ladder, types of farming, and towns. There were rather marked variations in the association of nationality with types of farming. A certain degree of association existed between soil type and type of farming. The data for two towns showed that 49 and 67 per cent, respectively, of the farms of native-born and foreign-born owners were mortgaged. A slight negative association existed between the assessed value of mortgaged farms and the size of the mortgage debt. Practically no correlation was found between the existence of a mortgage and farm-boy experience of the owner.

Present owners who had passed over the nonindependent owning rounds of the agricultural ladder had spent from 4 to 6 years less upon these rounds than had cooperators now occupying such rounds. The percentage of the cooperators having previous farm-boy or farm-hand experience varied from 15 to 80 in the different types of farming. The farm-boy period had no or only a low correlation with the age of the cooperator, period of ownership, or period of independent farming. The period of ownership and the period of independent farming each had a medium to high correlation with age. The modal routes to ownership were found to be farmboy-farmhand-to-owner for dairying and tobacco growing; direct-to-owner for poultry and fruit farming and small farms; and the one-step-before-ownership route for vegetable and general farming.

Continuity in types of farming varied greatly between towns, nationalities, and types of farming. The modal age period for moves in time was 20 to 24 years. The average age was 26.5 years. Both a sex and a generation variant was found in vocational stability among farming occupations. Tendencies were found for man work units per man to increase with the total work units comprising a farm business and for labor to be more efficient in mixed or diversified types of farming. Little or no correlation was found between labor efficiency per man and total years of farming, years of farming for self, years of working for others, years in present type of farming, and years of schooling, and size of family. A high degree of positive relationship existed between vocational stability and age and years spent in agriculture, in present tenure, in independent farming, and in town. A medium to low correlation existed between vocational stability and years of nonindependent farming and of schooling. A moderate negative relation was found between vocational stability and years spent in nonagricultural pursuits.

The origin and character of the rural population (*Connecticut Storrs Sta. Bul. 162 (1929), pp. 20–22*).—In this brief progress report, tables are given showing by type of farm the following: For 400 farm operators the average number of years of farming and number of years in present type of farming, for 286 farm owners the percentage having made no change and having made 1, 2, and 3 or more changes in type of farming, and for 408 farms the stages passed through in coming to ownership.

Farm family living among white owner and tenant operators in Wake County, 1926, W. A. Anderson (*North Carolina Sta. Bul. 269 (1929), pp. 101, figs. 20*).—This study, made in cooperation with the North Carolina Department of Agriculture, is the second of the series previously noted (E. S. R., 60, p. 386). It is based on the data noted in the previous bulletin, together with those from 300 white tenant families, 15.4 per cent of those in the county, obtained in the same survey. Tables and graphs along the same lines as in the first bulletin are presented and discussed comparing the two classes of operators.

The averages found for the owner and tenant groups, respectively, were gross cash income, $2,505 and $980; value of food produced on farms, $657 and $200; value of fuel produced on farms, $51 and $40; percentage of gross cash income of less than $2,000, 57.8 and 93.7; percentage of gross cash income over $4,000, 15.7 and 1.1; percentage of expenditures exceeding gross cash income, 42.3 and 28.7; percentages of income from crops 62.9 and 89.4, extra work 8.4 and 4.7, animals 13 and 4.6, investments 12.9 and 0.78, and miscellaneous sources 2.8 and 0.53; and percentages of cash expenditures for farm expenses 32.5 and 26.3, investment 19.6 and 1.3, home and household expenses 7.3 and 3.3, food and fuel 6.9 and 18.1, health 3.4 and 4.4, extra education 2.4 and 0.4, insurance 1.4 and 3.1, clothing 12.3 and 22.1, reading 0.6 and 0.8, personal expenses 1.8 and 5.8, automobile 9.2 and 12.8, church and charity 2.2 and 1.2, and social activities and recreation 0.4 and 0.4.

Factors influencing living conditions of white owner and tenant farmers in Wake County, 1926, W. A. Anderson (*North Carolina Sta. Tech. Bul. 37* (*1930*), *pp. 58*).—Gross, partial, and multiple correlation analysis is made of the data from 278 of the owner and from 296 of the tenant families included in the study noted above. No families with a gross cash income exceeding $5,000 or with less than two adult members were included. The variables used were number of acres of farm land in crops, number of school grades completed by the male head of the family, number of years farmed by the farm operator, size of the farm families standardized according to the revised Atwater scale, percentage of the total expenditures utilized per family for the farm and investments, value of the food and fuel produced on the farm for family consumption, percentage of the total expenditures used for food and fuel during the year per family, percentage of the total expenditures used for clothing for the whole family during the year, percentage of the total expenditures used for automobile for the year, percentage of the total expenditures used for personal items by all members of the family during the year, percentage of the total expenditures used for home and household furnishings, and percentage of the total budget used for advancement during the year per family.

The data are analyzed and discussed under the headings of (1) factors influencing food and fuel expenditures, expenditures for home and household goods, and the proportion of the expenditures used for the automobile; and (2) the influence of various factors upon the production of food and fuel for family use, upon expenditures for clothing, expenditures for personal items, and expenditures for advancement. In each case the effect of holding factors constant, the influence of individual factors, and the effect of changes in different factors are considered.

The highest percentage determinations found were in the influence of the various factors upon the proportion that food and fuel, clothing, and the automobile were of the total budget. Gross cash income, proportion of the expenditures used for farm and investments, food and fuel, clothing, and for the automobile, and the size of family were chiefly responsible for the variations in the expenditures for each of these items. All the factors considered, however, accounted for only 43 to 72 per cent of the factors determining expenditures for budgetary items. The factors studied accounted for only 15 to 44 per cent of the variations in the proportion of the expenditures used for personal items, for home and household, and for advancement. The proportion of the expenditures used for farm and investments and for the automobile were the chief influencing factors.

Gross income and the proportion of the expenditures used for farm and investments and for the automobile exerted the largest relative influence upon the proportions that the various items of the family living of owners were of the total expenditures. With increases in the gross income of owners, the proportions of the expenditures for family living decreased, and those for farm and investments increased. Changes in the proportion of the expenditures used for farm and investments exerted the greatest influence on the various elements of the family budget of owners, the influence being important in the cases of expenditures for food and fuel, clothing, automobile, home and household, personal items, and advancement. The proportion of the expenditures used for the automobile was the third most important factor affecting the family living of owners, influencing more especially the proportions of expenditures going for food and fuel, clothing, home and household goods, and advancement.

In the case of tenant families, changes in income and in the proportions of the expenditures going for the automobile and for farm and investments were the most important factors in determining family living expenditures, that for the automobile being the most important factor. With increases in the proportions of the expenditures used for food and fuel, clothing, and the automobile, tenants increased the proportions used for personal items.

An increase of 100 per cent in income resulted in an increase of only 3 per cent in the proportions of the expenditures used for advancement in the case of owners and a decrease of 2 per cent in the case of tenants.

The use of leisure in selected rural areas of South Carolina, M. E. FRAYSER (*South Carolina Sta. Bul. 263* (*1930*), *pp. 87*, *figs. 11*).—This report is based on individual records obtained in 1927–1929 from operators and members of the families over 21 years old on 368 farms in selected areas of four counties of the State. Of the 782 records taken, 587 were for white owner families and 195 for white nonowner families. Of 130 records, 19 were for negro owner families and 111 for negro nonowner families.

Tables are given and discussed for each type of family—white and negro, owner and nonowner—showing the acreage of farms, size of families and households, educational attainments, and farm and home equipment. Other tables and charts are included and discussed showing for each type of farm the average number of hours per week spent in different kinds of reading, different church interests, specific educational interests, planning work and keeping records, attendance at secular organizations of different kinds, amusements of different types, seasonal leisure-time activities, and miscellaneous uses of leisure time.

Recommendations are made as to means of improving the facilities for and use of leisure time in the rural areas of the State.

Relation of town and country interests in Garfield County, Oklahoma, J. F. PAGE (*Oklahoma Sta. Bul. 194* (*1930*), *pp. 47*, *figs. 7*).—The primary purpose of this study was to discover the reciprocal service relationships of farmers and townsmen, and the secondary to find out the attitudes of each class toward such relationships. The data were gathered in 1926–27 (1) from representatives of 1,143 farm homes through personal interviews with farmers or their wives and by questionnaires filled out by pupils of the graded and high schools; and (2) regarding the villages, towns, and cities by personal canvass of ministers, secretaries of lodges and clubs, merchants, professional people, etc.

Tables are included and discussed showing (1) for owners and tenants the percentages of families having conveniences of different kinds and taking periodicals of different kinds and the average number taken; and (2) by population centers grouped in four groups as to size, where farm families trade, bank, obtain professional services, etc., the value of stock carried and expenditures for advertising, sales to farmers in different types of stores, business with and interest of farmers in banks, and attendance at and support of schools, churches, lodges, motion pictures, and fairs by farm families. Other tables set forth the farmers' reasons for their service relations with particular population centers, Some of the tables show comparatively the data obtained from farmers and their wives and from school pupils.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The agricultural extension system of the United States, C. B. SMITH and M. C. WILSON (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. X+402, figs. 59*).—This book is noted editorially on page 201.

Thomas B. Osborne: A memorial (*Connecticut State Sta. Bul. 312 (1930), pp. 275–394, fig. 1*).—As stated in the foreword, "this bulletin aims to serve as a memorial of him by the colleagues with whom he labored daily, showing also something of his varied interests and activities aside from the problems of his life work, and something of those qualities which compelled the admiration of his associates and won their affection." It contains a brief tribute by E. H. Jenkins entitled Dr. Osborne as an Associate (pp. 281, 282); reprints of an article by H. B. Vickery and L. B. Mendel[3] entitled The Work of Thomas Burr Osborne (1859–1929) (pp. 283–290); selected papers of Dr. Osborne entitled Our Present Knowledge of Plant Proteins (pp. 291–303), The Chemistry of the Proteins (pp. 304–321), What and How Much Should We Eat? (pp. 321–333), Migrations of Birds (pp. 333–339), Thoughts on Biochemistry (pp. 339–346), and Notes on the Nest Building Habits of the Pipe Organ Wasp (pp. 346, 347); a list of honors and memberships; tributes paid on his retirement; reprints of selected obituary notices, including that in these columns (E. S. R., 60, p. 701); and a bibliography of 252 titles.

FOODS—HUMAN NUTRITION

The nutritive value of New Zealand spinach, L. McLAUGHLIN (*Jour. Nutrition, 2 (1929), No. 2, pp. 197–202*).—Raw and cooked leaves of New Zealand spinach (*Tetragonia expansa*) were analyzed for moisture, total ash, calcium, phosphorus, and iron and the raw leaves tested for vitamins A and B. Two methods of cooking were followed. In the first the leaves were cooked in the upper part of an enamel double boiler, with no water other than the clinging wash water, and the other in a definite volume of boiling tap water. In both cases the cooked product was drained and the solids and liquids were analyzed separately.

The material cooked without added water retained its distinctive flavor with a slight astringent aftertaste. Cooking 50 minutes in the double boiler gave a mushy product and 35 minutes a tender one, although the brilliancy of the green color was lost. Cooking for 10 minutes in excess water gave an attractive tender product with mild flavor. Analyses of the products showed that in the former method one-sixth of the mineral salts, including from one-eighth to more than one-fourth of the iron, was drained off in the cooking liquor, but with little loss of calcium and phosphorus. The liquid obtained by the second method contained very little calcium, but about 40 per cent of the total salts and more than 60 per cent of the phosphorus. In comparison with the average composition figures for other common leafy vegetables, New Zealand spinach, "even when cooked in a large volume of water and drained longer than is customary before serving, is found to be as rich in mineral salts as raw spinach and to be richer in iron and as high in calcium as lettuce or cabbage served raw."

In the vitamin A tests about 90 mg. of the raw leaves per week were required for standard growth according to the Sherman-Munsell method. A slightly smaller amount of ordinary spinach grown under the same conditions induced a somewhat larger gain in weight. In the vitamin B tests 1.4 gm. was required to maintain 50-gm. rats at constant weight for 8 weeks. On 1.6 gm. daily rats weighing 37 gm. each gained about half as much in 8 weeks as rats of the same weight receiving 1.4 gm. of ordinary spinach. It is concluded that New Zealand spinach is very rich in vitamin A and a good source of vitamin B.

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[3] Science, 69 (1929), No. 1789, pp. 385–389.

High altitude bread baking with Wyoming flour (*Wyoming Sta. Rpt. 1929, pp. 24–27*).—In addition to a summary of Bulletin 162 (E. S. R., 61, p. 192), this report contains directions for the use of Yeast Foam in high altitude bread baking. Potato water is included in the recipe. It is considered important for speeding up the leavening process, but not absolutely essential.

Preliminary studies on changes in Wyoming flour on storage showed no important change in three months with the exception of a fairly rapid loss of moisture in flour stored in a cabinet.

Preserving fruits by freezing (*Georgia Sta. Rpt. 1929, pp. 20, 21*).—In an attempt to determine the best means of preserving Georgia fruits by the freezing method. peaches, pears, muscadine grapes, blackberries, raspberries, and figs were packed in glass, tin, and pasteboard containers and kept in the freezing room at a temperature of from 5 to 10° F. for about six months. Some of the lots were stored with no additions, others with small amounts of water, sugar, and sugar solutions of varying concentrations.

The method of handling which gave the most satisfactory results consisted in preparing fully ripe fruit as if to be eaten immediately, placing it in pasteboard cartons of any desired size, covering it with a sirup made by dissolving from 6 to 8 lbs. of sugar in each gallon of water, closing the cartons, and leaving them in the freezing room until wanted. It is said that the color, taste, and aroma of fruits treated in this way are preserved perfectly, and that there is apparently no limit to the length of time that fruits may be preserved in this manner.

Drying cut fruits, P. F. Nichols and A. W. Christie (*California Sta. Bul. 485 (1930), pp. 46, pls. 2, figs. 18*).—This publication, which supersedes Bulletins 330 (E. S. R., 45, p. 808) and 337 (E. S. R., 46, p. 509) concerning the dehydration of cut fruits and the portions of Bulletin 388 (E. S. R., 53, p. 614) pertaining to the sulfuring of cut fruits for drying, deals especially with present practices in the use of sulfur dioxide in preparing cut fruits for drying.

Tables showing the production and utilization during 1923 to 1927 of apples, apricots, peaches, and pears, the four fruits which constitute the principal California fruits which are cut before drying, are followed by a general discussion of the reasons for cutting fruits before drying and of the various methods of pretreatment employed. The use of sulfur dioxide is then discussed in detail, including Federal, State, and foreign regulations, the principles upon which its use depends, the construction and operation of sulfur houses, and the effect of various factors upon the appearance and final sulfur dioxide content of the product. The relative merits of evaporation and dehydration for apples and of sundrying and dehydration for apricots, peaches, and pears are discussed, and in conclusion the conditions necessary for successful storage of dried fruits are outlined briefly.

A study of the food at St. Paul's School, E. Hawley ([*Concord, N. H.*]: *St. Paul's School*, [*1929*], *pp. 33*).—This survey of food habits at St. Paul's School, a boarding school for boys of 13 to 19 years of age, supplements a similar survey conducted in the same school by Gephart in 1914–15. In the earlier study only fat, protein, carbohydrate, total energy, and cost were considered and in the present protein, total energy, cost, calcium, phosphorus, and iron. For purposes of comparison the figures obtained have been compared with those reported in various studies, chiefly those of college students recently summarized (E. S. R., 62, p. 187).

When calculated on the same basis with prices at the 1926 level, the present figures for the school show an increase of 20 per cent in food expenditure during the 12 years since the earlier study. In terms of available energy the costs were the same during the two periods, showing that the difference in total cost could be attributed almost entirely to increased waste of food in the later period. In terms of adequacy of the diet the calorie consumption was 31, protein 66, calcium 60, phosphorus 33, and iron 20 per cent above the estimated needs. On the basis of a well-proportioned diet, the author considers that meat, fish, eggs, and milk were used in excess and fruits, vegetables, and cereals in relatively insufficient quantities.

According to the growth measurements the boys were slightly taller than the average American boy, but were of the normal average weight for height and age.

The diets were as well balanced as those of the college students, but cost about twice as much. This difference is attributed to the greater waste of food and the more liberal use of some of the more expensive foods such as milk, cream, and cheese.

In the general discussion the question of waste is emphasized particularly, and various suggestions, which should be of value to those in charge of similar institutions, are offered to reduce this waste. Education of the boys themselves in proper food habits is thought to afford the best solution of the problem.

The mechanics of digestion, W. A. Alvarez (*Jour. Amer. Dietet. Assoc., 5 (1929), No. 3, pp. 180–183*).—The points emphasized in this paper, read before the American Dietetic Association at Detroit, Mich., on October 7, 1929, are "(1) that the mechanical factors of digestion are of extreme importance, (2) that the consistence and cellulose content of food is often of much greater importance than its vitamin content, and (3) that we do not have to concern ourselves about the vitamins in diets designed for patients with transient illnesses."

Studies upon edible cellulose.—I, Recovery of crude fiber from raw and cooked potato cellulose, S. Woodruff and E. F. Miller (*Jour. Amer. Dietet. Assoc., 5 (1929), No. 1, pp. 23–27*).—A comparison is reported of the amounts of crude fiber recovered in the feces of rats fed upon diets containing equivalent amounts of raw and baked potato in one series and raw and cooked potato fiber in another. In both series crude fiber was recovered in the feces in greater amounts when fed uncooked than when fed cooked. On the diets containing raw or baked potato the recovery of cellulose was higher than on corresponding diets containing the potato fiber.

Influence of fiber on nitrogen balance and on fat in the feces of human subjects, J. Whitacre, A. Willard, and K. Blunt (*Jour. Nutrition, 2 (1929), No. 2, pp. 187–195*).—The question as to whether the presence of fiber in varying amounts in the ordinary diet affects the utilization of the nutrients is answered in this paper by a critical examination of various balance experiments reported in the literature. The studies examined in greatest detail were those previously reported by Whitacre and Blunt (E. S. R., 56, p. 896) and Willard and Blunt (E. S. R., 58, p. 290). In these two studies, in both of which the senior author of the present paper served as subject, the experimental diets contained liberal, though not unusually large, amounts of fiber. The coefficients of digestibility of the nitrogen in the two studies were distinctly and consistently lower than the average value for mixed diets (85 to 87 in one case and 88 to 89 in the other as compared with the usual 92). The coefficients of digestibility of fat, however, were slightly higher in the first study than the usually accepted figure of 95.

Further evidence that the coefficient of digestibility of protein is lowered and that of fat not affected by the presence of fiber is noted from the findings of McLaughlin (E. S. R., 58, p. 191) that when relatively large amounts of spinach replaced milk in the experimental diet the average coefficient of digestibility for protein for seven subjects fell from 91.9 to 88.6, while the coefficients of digestibility of the fat remained about the same, 97.2 and 97.7. Earlier studies of Woods and Merrill (E. S. R., 12, p. 776) on the relative digestibility of white, entire wheat, and Graham bread when eaten with milk are noted in which the coefficients of digestibility of the protein were 93.6, 91.7, and 88.6, respectively, while those of fat were 95.5, 96.5, and 95.5. Other studies noted as pointing to the same conclusion are those of Blunt and Mallon on the digestibility of bacon (E. S. R., 41, p. 467), of Holmes on the digestibility of wheat bran with various other foods (E. S. R., 41, p. 64), and of Mitchell upon the effect of roughage on the fecal nitrogen of rats (E. S. R., 51, p. 407).

Effect of fatigue on protein consumption, F. P. Brooks (*Soc. Expt. Biol. and Med. Proc., 27 (1929), No. 1, pp. 37–44, figs. 2*).—In connection with the investigation of the protein intake of medical students (E. S. R., 62, p. 582), the author has plotted the daily values for nitrogen excretion in the urine of 70 subjects through a period of approximately 105 weeks. These values show a tendency toward a decreasing daily excretion from Sunday to Saturday, which is interpreted as indicating a fatigue effect upon protein consumption. It is thought, however, that specimens collected any day of the week may be used to give an accurate idea of the protein consumption of the group if the group is large enough.

The relation of calcium in the saliva to dental caries, K. Horton, J. Marrack, and I. Price (*Biochem. Jour., 23 (1929), No. 5, pp. 1075–1078*).—A comparison of the extent of dental caries and the calcium content of the saliva of a large number of children, chiefly patients of a dental clinic, has led to the conclusion that dental caries is associated with a reduction in the concentration of calcium in the saliva, but that the reduction is secondary to the caries. The examination of the saliva of a much smaller number of children for inorganic phosphorus showed no variation with the extent of caries.

Do baking powder residues exert injurious effects upon growth and nutrition? W. C. Rose and F. L. Catherwood (*Jour. Nutrition, 2 (1929), No. 2, pp. 155–169, figs. 6*).—This study of the possible injurious effects of three types of baking powders was undertaken on account of the conflicting statements in the literature and "the apparent uncertainty which still exists in the minds of many as to the possible injurious effects of baking powder components." The three baking powders, representing tartrate, calcium acid phosphate, and calcium acid phosphate plus anhydrous sodium aluminum sulfate types, were incorporated in an artificial complete diet in amounts representing the same proportion to the solid ingredients of the diet as recommended for the particular baking powders in proportion to flour, the whole being baked in biscuit form. These were furnished to groups of rats ad libitum, with an allowance of 20 gm. of head lettuce per rat every four days. The experiments with negative controls were conducted through two generations.

In no case could any injurious effects be detected, although in some series twice the recommended amount of the baking powder was used and in all cases the amount of food consumed would represent an intake of baking powder far in excess of what would ever be taken in an ordinary diet. The animals receiving the powders grew as rapidly and reproduced as satisfactorily as the controls receiving no baking powder. Analyses of the blood and histological examinations of the kidneys showed no harmful effects.

The dietitian and normal nutrition, L. J. Roberts (*Jour. Amer. Dietet. Assoc., 5 (1929), No. 1, pp. 11–22*).—In this plea against dogmatism in teaching the requirements of an adequate diet illustrations are drawn from the methods employed by the author in her dietaries classes to check the adequacy of any diet. These illustrations show that an adequate diet may be secured in many ways, and that the diets of other races are often more adequate than the so-called American diet.

Recent advancement in the study of basal metabolism in health and disease, C. C. Wang and J. E. Hawks (*Jour. Amer. Dietet. Assoc., 5 (1929), Nos. 2, pp. 87–101; 3, pp. 184–197*).—This is a critical review of the literature on the subject under the general headings of essential principles, governing factors, and metabolism in disease. Over 200 literature references are cited.

Cyclic variations in the basal metabolic rate of women, F. A. Hitchcock and F. R. Wardwell (*Jour. Nutrition, 2 (1929), No. 2, pp. 203–215, fig. 1*).—From statistical analyses of a total of 625 basal metabolism determinations on 20 women, including 155 tests during the menstrual periods and 470 between menstrual periods, the following conclusions were drawn:

"There is a strong tendency for the metabolic rate to be lowered during the menstrual period. A second low point in the metabolic rate occurs about the middle of the intermenstrual period. In many cases the mental state of the subject seems to have a marked effect on the basal metabolic rate. There seems to be a seasonal variation with the lowest metabolic rate occurring in the winter or spring and the highest in the summer or autumn. The time of year at which the metabolic rate begins to increase seems to depend to some extent on the personal habits of the subject."

Basal metabolic rate in advanced age, C. G. L. Wolf (*Soc. Expt. Biol. and Med. Proc., 27 (1929), No. 1, pp. 26, 27*).—Data are summarized on the basal metabolism of four subjects, three men and one woman, whose ages ranged from 72 to 89 years. According to the Harris-Benedict standards the values ranged from +5 to +15. By the Aub and DuBois standards the three male subjects had slight negative values, the lowest of which was —9.2. By the Dreyer standards there was only one negative value, —2.7.

It is noted that the subjects were all of great mental and physical vigor, as was also noted by Benedict for the 89-year-old subject with unusually high basal metabolic rate (E. S. R., 60, p. 389), while the six old men for whom Aub and DuBois reported very low values showed marked signs of senility.

Vitamin investigations (*Georgia Sta. Rpt. 1929, pp. 25–27*).—In this progress report (E. S. R., 61, p. 193), it is stated that cantaloupes of the Hearts of Gold variety contain at least 3 vitamin A units (Sherman) per gram or 85 units per ounce, and that 2 gm. of the cantaloupe contain slightly more than a unit of vitamin B, representing at least 14 units of vitamin B per ounce.

In addition to data on the vitamin C content of turnip greens noted in the previous report, a report is given of the effect of canning on the vitamin C content. The greens were canned by two methods. In the first the leaves were washed, blanched in boiling water for 1 or 2 minutes, packed into cans, exhausted, sealed, and processed for 1 hour at 5 lbs. pressure, after which they were removed from the cans and boiled for 8 minutes in a saucepan as would be done by the housewife. Of the greens prepared in this way, 4 gm. proved the minimum protective dose against scurvy, showing in comparison with the previously noted content of the fresh greens a loss of 92.5 per cent. The second method followed the commercial process more closely, the chief difference being blanching in live steam instead of boiling water. The greens canned in this manner showed only about half as great a destruction of vitamin C as by the other method.

In preliminary studies with collards, a daily dose of 0.03 gm. of the raw material or its equivalent of collards boiled for 2 hours was not sufficient to bring about the standard gain of 25 gm. in 8 weeks in the vitamin A tests, thus showing that collards are not as rich as turnip greens in vitamin A. In the vitamin C tests 0.2 gm. of raw collards was not quite sufficient to protect against scurvy, but 0.5 gm. afforded complete protection.

The influence of different samples of "casein" on vitamin tests, K. H. Coward, K. M. Key, B. G. Morgan, and M. Cambden (*Biochem. Jour., 23 (1929), No. 5, pp. 913–920, figs. 3*).—Supplementing a previous investigation in which evidence was furnished of some factor essential for growth which is present in "light-white casein" but absent from vitamin-free casein (E. S. R., 62, p. 589), a comparison was made of the two caseins as the source of protein in the usual vitamin A and vitamin B tests. For the former, on account of the probable presence of some vitamin A in light-white casein, the casein was subjected to a preliminary extraction with alcohol and ether. Five different litters were divided, half of each receiving the extracted light-white casein and half the vitamin-free casein. In the preliminary depletion period, the growth curves of the animals in two of the litters were similar for both forms of casein, while in the other litters the growth was greater on the extracted casein than on the vitamin-free casein. On supplementing the diets with cod-liver oil as the source of vitamin A, the growth of all of the animals receiving extracted light-white casein was greater than that of the animals in the other group.

In view of the fact that the growth varied with the litters rather than the individual animals, the authors are of the opinion that "such variations were due to variations in reserves of some factor obtained from previous feeding rather than to a deficiency of the protein as such. Whatever the explanation proves to be, this experiment clearly demonstrates that any dose of cod-liver oil can bring about very different responses in the growth of rats according to the kind of casein which is their source of protein."

In the vitamin B tests greater uniformity of results was obtained by the use of light-white than of vitamin-free casein. Since the light-white casein contains neither vitamin B_1 nor B_2, it does not need to be extracted before use in vitamin B testing.

It is emphasized in conclusion that "the difference due to the different caseins in vitamin A testing is so great that an estimate based simply on the growth response of a number of animals in relatively undefined conditions (as in the United States Pharmacopoeia cod-liver oil test) must give widely different results in the hands of different workers. Vitamin A tests (of food substances at least) to be of value must be comparative, and it is suggested that all workers should use a common standard of reference."

A comparison of the nutritive properties of soybean "milk" and cow's milk, E. Tso (*Chinese Jour. Physiol., 3 (1929), No. 4, pp. 353–362, figs. 5*).—As a further evaluation of the nutritive properties of soybean milk (E. S. R., 61, p. 190), the material as prepared for infant feeding was compared with reconstituted Klim and Vitamilk, two proprietary preparations of dried milk, as a source of vitamins A and B, proteins, and mineral salts. From the preliminary experiments reported, it is concluded that soybean milk is comparable to cow's milk in its content of vitamin A and richer in vitamin B. At a level of 22 per cent the soybean milk proteins were slightly superior, and at 14 per cent inferior, to those of cow's milk fed at a level of 11 per cent. As noted in a previous paper, the mineral content of soybean milk is inferior to cow's milk, but it is thought that the addition of a calcium salt and common salt would make up for this deficiency.

Vitamin C content of Japan green tea, H. S. Mitchell (*Jour. Amer. Dietet. Assoc., 5 (1929), No. 1, pp. 28–31*).—The data reported in this paper confirm the conclusions drawn by Munsell and Kifer (E. S. R., 62, p. 295) that there is no demonstrable amount of vitamin C in Japan green tea. The tests included two series of experiments on samples of pan-fired green tea from the 1927 and 1928 crops. An infusion of the tea was made by adding 100 cc. of boiling water to 2 gm. of tea, shaking the container at intervals for 5 minutes, straining, and making up the infusion to 100 cc. This was fed in portions of from 15 to 25 cc. but afforded no protection.

Hypervitaminosis and vitamin balance.—IV, An instance of vitamin balance, L. J. Harris and T. Moore (*Biochem. Jour., 23 (1929), No. 5, pp. 1114–1121, figs. 4*).—In continuation of the investigation previously noted (E. S. R., 62, p. 196), further experiments are reported confirming the existence of a balance between the vitamin B complex and the vitamins A and D of cod-liver oil (E. S. R., 61, p. 297).

In the present series two samples of cod-liver oil concentrates containing both A and D were used in place of cod-liver oil, and a marmite extract as the source of vitamin B. The marmite was given in amounts of 1, 2, 4, 8, 16, and 32 per cent of the diet and the concentrates in amounts of 2, 10, 50, and 250 mg. daily, the experiments being so arranged as to compare the effects of variations either in the marmite for each level of the concentrate or in the concentrate for each level of the marmite. "The results obtained have been distinguished by a remarkable regularity in the retarding action of the vitamins A and D concentrate upon growth rates. This action has been found, in fact, to be no less regular than the inverse accelerating action of marmite, and in no case (except at totally inadequate levels of marmite) has any growth curve fallen out of its predicted position."

It is thought that this antagonistic effect is exerted between the vitamin B complex and vitamin A, although it is recognized that the possible action of other unidentified substances is not excluded.

Observations on the serum calcium and inorganic phosphorus in health and disease, T. A. Hughes, D. L. Shrivastava, and P. N. Sahai (*Indian Jour. Med. Research, 17 (1929), No. 2, pp. 461–469*).—In this investigation of the serum calcium and phosphorus of normal Indians and Europeans and Indian hospital patients, all living in Lahore, British India, calcium was estimated by the Kramer and Tisdall method (E. S. R., 46, p. 203) and phosphorus by the Briggs method (E. S. R., 48, p. 111).

The minimum, maximum, and average calcium figures for the 8 normal Europeans were 11.28, 12.40, and 11.74 mg. per cent and for the 16 Indians 11.91, 13.08, and 12.51 mg. per cent, respectively. The minimum and maximum values for phosphorus were 3.10 and 3.97 mg. per cent for Europeans and 3.04 and 5.05 for the Indians. As compared with the normal values reported in European and American literature, the calcium figures for the native Indians were high. It is suggested that this may be due to the excessive solar radiation in the Tropics, resulting in the continual formation of a relatively large amount of vitamin D in the skin and leading to increased absorption from the intestines.

Among the hospital patients, 11 of the 24 had calcium values within normal ranges, 8 below, and 5 above. The phosphorus was within normal limits in all cases.

Observations on the blood chemistry in osteomalacia, T. A. Hughes, D. L. Shrivastava, and P. N. Sahai (*Indian Jour. Med. Research, 17 (1929), No. 2, pp. 470–476*).—Estimations by the same method as in the study noted above were made of the serum calcium and inorganic phosphorus in 11 untreated cases of osteomalacia and 19 cases which had received treatment for varying periods. In all but 1 of the untreated subjects the serum calcium was normal or subnormal. In the treated cases improvement was usually associated with an increase in serum calcium. The inorganic phosphorus was in general lower in untreated than in treated cases. Most of the patients examined showed low values for blood cholesterol. The possibility is suggested that some other defect in the diet, possibly deficiency in vitamin A, played a part in causing this condition.

Osteomalacia (late rickets) studies, I–IV (*Indian Jour. Med. Research, 17 (1929), No. 2, pp. 339–347; (1930), No. 3, pp. 881–905, fig. 1*).—This investigation of osteomalacia (late rickets) in India, undertaken under the auspices of the Indian Research Fund Association, is reported in four papers, as follows:

I. *Clinical symptoms in relation to bone changes as shown by X-ray examination*, D. C. Wilson (pp. 339–347).—In this introductory paper the clinical symptoms of osteomalacia are summarized from personal observations of 135 cases among girls and women from 10 to 55 years of age in three cities of the Punjab, British India.

II. *The blood picture*, D. C. Wilson and G. P. Patel (pp. 881–887).—This report is based upon a series of 46 cases of osteomalacia in which the blood was examined on the patient's admission to the clinic and in about one-third of the cases after varying periods of treatment. The examination showed a slight degree of anemia, with an increase in hemoglobin following clinical improvement. In some instances there was a marked increase in the number of lymphocytes before treatment, followed after treatment by a varying but definite increase in polymorphonuclear leucocytes.

III. *Dietary factors in the aetiology of osteomalacia*, D. C. Wilson and E. Surie (pp. 889–902).—A survey of the dietary habits and housing conditions of 265 subjects afflicted with osteomalacia in four different districts of India is reported, with the following general conclusions:

The predominant factor was a consistent lack of vitamin D either in the diet or as a result of lack of sunlight. Among the Hindu population the dietary deficiency was the most important factor and among the Mohammedans lack of sunlight due to the practice of purdah among the women. The amounts of calcium and phosphorus in the diet were considered adequate for the most part. In certain sections where cases of late rickets or osteomalacia were found among men and boys as well as women and girls, the diets were found to be low not only in vitamin D but also in calcium and phosphorus. In some cases an excess of cereals in the diet was thought to be the determining factor.

It is noted that the diets were lacking in vitamin C quite as much as in vitamin D, and that the clinical symptoms did not clear up until fresh foods were included in the diet.

IV. *A preliminary note on the incidence of rickets and dental caries among school children in India*, D. C. Wilson and E. Surie (pp. 903–905).—In this preliminary report, data are summarized on the extent of caries and hypoplasia in the teeth of 100 children from 5 to 17 years of age suffering from rickets varying from mild to severe. The 14 children with very mild rickets showed some evidence of caries in 21 per cent and of hypoplasia in 85 per cent, while all of the 9 children with severe rickets showed both caries and hypoplasia. The degree of severity of caries and rickets appeared to run parallel.

An X-ray study of osteomalacia, V. E. Pilley (*Indian Jour. Med. Research, 17 (1929), No. 2, pp. 348–350, pls. 5*).—This is a description, illustrated by photographs, of the X-ray findings in early and late cases of osteomalacia before and after healing.

The use of isolated radiations in experiments with the rat.—I, The effect of infra-red radiation on the growth of the rachitic rat, E. M. L. Clausen (*Jour. Nutrition, 2 (1929), No. 2, pp. 125–153, figs. 9*).—In this complete report of an investigation noted previously from a preliminary report (E. S. R., 60, p. 694), the earlier conclusion is confirmed that infra-red radiation will stimulate growth in rachitic rats and prolong their survival period on the rickets-producing diet without affording any protection against the disease.

In one series of experiments, conducted during excessive summer heat, there was little response to infra-red radiation. This is thought to rule out the possibility that the effect of the infra-red radiation is a heat effect. Growth was stimulated to some extent by infra-red radiation given in conjunction with ultra-violet radiation to rats on the standard rickets-producing diet. In this report no attention was paid to the effect upon the thyroid glands noted in the preliminary report, but ash analyses were made of the bones of the animals in the different groups with the finding that lower A/R ratios (ash to organic residue) were obtained in rats receiving both infra-red and ultra-violet radiation than those receiving ultra-violet alone. The author is at a loss to explain this beyond suggesting that the infra-red radiation may modify the synthesis of vitamin D in the skin under the action of ultra-violet radiation, either by direct action upon the vitamin D already formed or by some independent action of the infra-red radiation which renders the sterols in the skin less easily activated by ultra-violet rays.

The report contains a diagrammatic scheme for the sampling of animals for the different groups to secure both equal representation of different families and equal average weights of the animals in each group.

Pellagra among the maize-eating natives of the Union of South Africa, E. H. Cluver (*Brit. Med. Jour., No. 3590 (1929), pp. 751–754*).—The author summarizes briefly various outbreaks of pellagra which have occurred among the natives of South Africa, and discusses in considerable detail an outbreak among various groups in Durban prison command from December, 1927, to December, 1928, inclusive. From an examination of the diets of the different groups and observations on the nature of the work and exposure of the prisoners in the various groups, it was concluded that the chief cause of the outbreak was the deficiency of the antipellagric vitamin in the maize (corn) which constituted a large part of the diet. The fact that the diet resulted in pellagra in Durban and not in other parts of the Union of South Africa was attributed to contributory factors, particularly the hard work in intense sunlight to which the prisoners were subjected.

Note on the etiology of pellagra, W. H. Wilson (*Brit. Med. Jour., No. 3602 (1930), pp. 101–103*).—In this discussion of the paper by Cluver noted above exception is taken to attributing the cause of the pellagra outbreak to a deficiency in the antipellagric vitamin. In the opinion of the author the cause was the low biological value of the protein of the diets, the relationship of which to pellagra has been discussed previously (E. S. R., 46, p. 762). It is conceded, however, that in the absence of a sufficiency of vitamin B_2 in the food a protein deficiency might manifest itself, and that in the presence of sufficient vitamin B_2 this would not be the case.

The alleged antineuritic properties of certain quinoline and glyoxaline derivatives, J. M. Gulland and R. A. Peters (*Biochem. Jour., 23 (1929), No. 5, pp. 1122–1125*).—This report of negative results obtained in the use of certain quinoline and glyoxaline derivatives for the cure of polyneuritis in pigeons by subcutaneous injection outlines further improvement in the technic of the curative test as described by Kinnersley, Peters, and Reader (E. S. R., 59, p. 294). This consists essentially in administering a standard dose of a torulin preparation which is curative for about three days before giving the substance under test. If the test substance does not prove effective, a second dose of the standard preparation of torulin is given. If this proves effective, the negative character of the material being tested is considered definitely demonstrated.

MISCELLANEOUS

Report of the director [of Connecticut Storrs Station], 1929, W. L. SLATE (*Connecticut Storrs Sta. Bul. 162 (1929), pp. 28*).—This contains the organization list, a report of the director, and a financial statement for the fiscal year ended June 30, 1929. The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-second Annual Report [of Georgia Station], 1929, H. P. STUCKEY (*Georgia Sta. Rpt. 1929, pp. 39, figs. 7*).—This contains the organization list, a report by the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1929. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Guam Agricultural Experiment Station, 1928, C. W. EDWARDS ET AL. (*Guam Sta. Rpt. 1928, pp. [2]+31, figs. 7*).—This contains reports of the director, the assistants in poultry husbandry and agronomy and horticulture, and the entomologist, and meteorological observations noted on page 113. This experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of the North Louisiana Experiment Station for the years 1928–1929, S. STEWART (*Louisiana Stas. Bul. 204 (1930), pp. 14*).—The experimental work here reported is for the most part abstracted on pages 130 and 161. Two years' results in a three-year rotation of corn and cowpeas, oats followed by cowpeas, and cotton, in which manure and commercial fertilizers are being compared, are also tabulated without conclusions.

Report of the Virgin Islands Agricultural Experiment Station, 1929, J. B. THOMPSON ET AL. (*Virgin Islands Sta. Rpt. 1929, pp. [2]+19, figs. 8*).—This includes the organization list, reports by the director, the animal husbandman and veterinarian, the horticulturist, and the agronomist as to the work of the station for the fiscal year ended June 30, 1929, and the agriculturist for St. Thomas and St. John. The experimental work reported is for the most part abstracted elsewhere in this issue, as are also meteorological observations.

Thirty-ninth Annual Report of [Wyoming Station, 1929], J. A. HILL (*Wyoming Sta. Rpt. 1929, pp. 52*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1929, a report of the director on the work of the station, and meteorological observations by F. E. Hepner (see p. 114). The experimental work reported is for the most part abstracted elsewhere in this issue. Data as to the variation in duplicate samples of wool in shrinkage tests are also included.

NOTES

Connecticut Storrs Station.—A new two-story and basement structure of brick and brownstone, erected at a cost of $42,000 to house the work in animal diseases and genetics, was dedicated June 12. This building is the first on the campus to be devoted solely to research and has been named the Atwater Laboratory in honor of Dr. W. O. Atwater, first director of the station and for many years intimately associated with various phases of its work in addition to his other well-known activities.

President George A. Works has resigned and will return to his former position in the University of Chicago.

Massachusetts College and Station.—Dr. Henry T. Fernald, head of the department of entomology and director of the graduate school, retired from active service on June 30 to become professor emeritus after 30 years of service. The department of entomology is now to be combined with that of zoology and geology, of which Dr. C. E. Gordon is head. Director F. J. Sievers of the experiment station is also to serve as director of the graduate school.

Minnesota University and Station.—Drs. F. J. Stevenson and Harvey E. Brewbaker, assistant professors of plant genetics and assistant plant geneticists, have resigned to accept appointments with the U. S. Department of Agriculture, the former in connection with potato breeding work in the Office of Horticultural Crops and Diseases and the latter for special work at Ft. Collins, Colo.

Rutgers University and New Jersey Stations.—The Mushroom Growers' Association of Pennsylvania has established at the station a three-year fellowship carrying $1,500 per year for the purpose of financing investigations of the use of artificial manure in commercial mushroom growing. The existing supplies of horse manure for this crop are becoming inadequate, and it is hoped that a substitute may be developed or a method devised for making horse manure last longer than one season as at present. Dr. S. A. Waksman is in charge of the investigations.

Ray Hutson, instructor in entomology, resigned July 31 to accept a position as associate entomologist in the Michigan College and Station. Juan A. Bonnet and Melville A. Clark have resigned as assistants in soil microbiology. Charles B. Howe, assistant professor of agricultural economics and associate station economist, has been granted a year's leave of absence for work with the Federal Farm Board.

New York State Station.—Dr. J. J. Willaman, chief in research in chemistry, has tendered his resignation, effective October 1, to enter commercial work. Dr. W. H. Rankin, associate in research (plant pathology) has been granted six months' sabbatic leave to carry on special studies at Cornell University. Dr. P. J. Chapman, entomologist at the Virginia Truck Station, has been appointed chief in research in entomology, effective July 1, and will direct the new entomological investigations on the apple maggot in the Hudson Valley. Other appointments include George W. Pearce, as assistant in research in entomology, effective July 1, for chemical investigations with insecticides, and H. L. Durham as dairy technologist.

North Dakota Station.—Dr. L. M. Roderick, assistant veterinarian, has been appointed acting head of the department of veterinary science.

Washington College.—Dr. F. L. Pickett, head of the college department of botany, has been appointed dean of the graduate school.

Wisconsin University and Station.—The graduate enrollment of students showed a total of 1,209 for the past academic year, of whom 204, or approximately 17 per cent, were in the College of Agriculture. Of these, 36 were in agricultural economics, 28 in agricultural chemistry, 26 in plant pathology, 25 in agricultural bacteriology, 19 in home economics, 15 in genetics, 14 in animal husbandry, 10 in soils, and the remainder in agricultural education, agricultural engineering, agricultural journalism, agronomy, dairy husbandry, economic entomology, horticulture, poultry husbandry, and veterinary science. The higher degrees granted in the College of Agriculture during the year totaled 83, of which 37 were doctors of philosophy.

For about a year the university work in sociology has been undergoing reorganization. Last year the department of economics and sociology in the College of Letters and Science was divided into separate departments, and a similar division has now been effected in the College of Agriculture, with a department of rural sociology distinct from the economic phases and with Dr. J. H. Kolb in charge. During the coming year a comprehensive national study of social changes and trends in the United States is to be made, and Dr. Kolb has been asked to assume joint responsibility for a subcommittee on rural social trends. To permit him to do this, the board of regents has approved a plan whereby he will be on a one-third time basis with the university for the five months' period ending March 15, 1931, his remaining time to be spent in the employ of the survey. Dr. Kolb will retain responsibility for the graduate students in rural sociology, but the undergraduate teaching of the department will be given by Conrad Taeuber, who has been appointed instructor in rural sociology.

Dr. L. R. Jones, who has been in charge of plant pathology matters since the organization of this work, retired in June as chairman of the department, but will continue his other duties on a part-time basis. Dr. G. W. Keitt has been appointed chairman.

Dr. Theodore Macklin has resigned as professor of agricultural economics to accept a position with the Federal Farm Board, and J. M. Hamilton as instructor in plant pathology. Dr. C. A. Elvehjem, who has been on leave of absence under a National Research Council fellowship at the University of Cambridge, is returning as assistant professor of agricultural chemistry. H. H. Bakken returns from a year's leave of absence spent in graduate study at Harvard University and will again conduct research and carry on extension work in farm marketing. Elizabeth McCoy, research assistant in agricultural bacteriology, returns after a year spent at the Rothamsted Experimental Station.

W. P. Mortenson, associate professor of agricultural economics in the Kansas College and engaged in marketing investigations in the Kansas Station, has been appointed assistant professor of agricultural economics, effective September 1, for research and teaching in the field of agricultural prices and statistics. Other appointments include S. A. Witzel as instructor in agricultural engineering and Waida Gerhardt as instructor in agricultural journalism, the latter vice Agatha R. Raisbeck.

Research at the American Society of Agricultural Engineers.—This society held its twenty-fourth annual convention at Moline, Ill., from June 16 to 19, 1930, with research very strongly in evidence. Several papers and addresses relating to the organization and prosecution of research were presented, and numerous field demonstrations and factory tests of machinery were staged to illustrate the development methods employed by manufacturers of equipment.

The program was opened by J. B. Davidson of the Iowa Experiment Station with a paper on training men for research in agricultural engineering. This paper stressed the importance of advanced training for research engineers and particularly that of training in collateral sciences and in the cooperating branches of agriculture.

An able presentation followed of the problems of industrial research, by C. F. Kettering, president of the General Motors Research Corporation. The importance of a clear objective for a particular line of research and of a well-organized plan of procedure as necessary preliminaries to securing research equipment was stressed, and numerous instances were cited where better results were secured with limited equipment selected for specific purposes than with extensive equipment selected on a general utility basis.

Dr. A. F. Woods, Director of Scientific Work of the U. S. Department of Agriculture, gave an inspiring address on engineering research applied to agriculture. In this special attention was drawn to a proposal to establish a bureau of agricultural engineering in the Department, and a general discussion was given of the research program projected.

The status and progress of agricultural engineering research during 1929 was reviewed by R. W. Trullinger, of the U. S. D. A. Office of Experiment Stations. It was pointed out that research in power and machinery and land reclamation has developed considerably and has made marked progress. That in rural electrification is just beginning on an extensive scale in the agricultural experiment stations, while that in farm structures is in general not very extensive or very profound.

In a paper on the engineer in tillage research, H. B. Walker of the California Experiment Station gave a critical analysis of the dynamics, mechanics, and technology of soil tillage. This paper represented the consensus of views of the Pacific coast section of the society as prepared by a special committee.

Dr. R. A. Clemen of Armour and Company discussed the industrial uses of agricultural products and pointed to the necessity for intensive research in that connection, while F. A. Wirt of the J. I. Case Company combined inspiration and information in an address on farm machinery and the growth of America. The influence of research in the development of power- and labor-saving methods and equipment for farming was traced and picturized, with comparisons between the economic conditions of different periods of American life. Under the title of Engineers, Farmers, and To-morrow, Wheeler McMillen, associate editor of *The Country Home*, also depicted various economic conditions in farming of the present and future.

The convention closed with a symposium on the all-purpose tractor in corn production, contributed to by I. C. Marshall, R. H. Wileman of the Indiana Experiment Station, J. L. Ahart, R. I. Shawl of the Illinois Station, and E. M. Mervine of the Iowa Station.

Officers elected for the ensuing year are as follows: President, R. W. Trullinger of the U. S. D. A. Office of Experiment Stations; vice presidents, B. D. Moses of the California Experiment Station and H. H. Worthington; secretary-treasurer, Raymond Olney; and councilor, L. A. Jones of the U. S. D. A. Bureau of Public Roads.

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Edible canna investigations.—Starch properties, J. C. RIPPERTON and C. RICHTER (*Hawaii Sta. Rpt. 1929, pp. 22, 23*).—For the determination of the swelling power of the starch of edible canna the authors developed a method of which the detail is covered essentially by the following statement:

The starch was gelatinized in a small Erlenmeyer flask "by means of hot water delivered from a 100-cc. pipette. The rolling motion produced in the flask by the hot water keeps the starch granules perfectly scattered while they are being subjected to a temperature which constantly rises until it reaches 80° C. The flask is then kept for 15 minutes at 80°. After 15 minutes the starch solution is poured into a graduated cylinder containing 190 cc. of distilled water at room temperature, and the contents are thoroughly mixed by inverting the cylinder several times. The solution is then allowed to stand overnight. The starch granules have then settled with a sharp, well-defined boundary surface and a clear supernatant liquid. The volume of the swollen starch granules can be read in cubic centimeters. Since in no part of the entire process is the starch solution stirred or agitated, a large part of the starch exists as unbroken granules in the solution. By determining the swelling power, study is made of the properties of the swollen granules instead of an indefinite mixture of broken and ruptured granules as is usually done."

By the use of this method it was found that "the swollen granule is negatively charged and as such is affected largely by cations. Anions have very little specific effect, but cations cause a reduction in the swell of the granule in proportion to their valence. By plotting the depression of the swell against concentration of cations, a curve is secured which is similar to the adsorption isotherm of a typical colloid. It has been found that the swelling power of a starch can not be taken as an exact measure of its viscosity. Although for the large proportion of starches a high swelling power is associated with a high viscosity, and vice versa, there are numerous exceptions to the rule. . . .

"It was found possible to affect the viscosity and swelling power of a starch greatly by treating the raw starch at room temperatures with various salts and removing the excess salts by subsequent washing with distilled water. Again, the cations were the determining factors. The monovalent ions tended to increase the viscosity and swell, whereas the bivalent ions depressed the values." A number of starches were electrodialyzed, and the amount of the cations and anions covered was determined.

On the reducing sugars produced by certain bacteria from starches and cellulose [trans. title], W. H. PETERSON, S. W. SCOTT, and W. S. THOMPSON

(*Biochem. Ztschr.*, *219* (*1930*), *No. 1–3*, *pp. 1–6*, *figs. 2*).—This is a contribution from the University of Wisconsin and is concerned with the breakdown products found in cultures of *Chlostridium acetobutylicum*, *Bacillus amylobacter*, *B. saccharobutyricus liquefaciens*, and a cellulose-attacking microorganism not named. In the cases both of the starch and the cellulose cultures the sugar formed was identified, by the nitrogen content and the melting point of the osazone, etc., as dextroglucose. In the case of the starch decomposition, no maltose could be found and cellulose cultures yielded a nonidentifiable cellobiose. It was possible to show the presence of a soluble polysaccharide among the products of the cellulose fermentation.

α and β lactose in some milk products, H. C. Troy and P. F. Sharp (*Jour. Dairy Sci.*, *13* (*1930*), *No. 2*, *pp. 140–157*, *fig. 1*).—Between the pH values 2.0 and 7.0 the authors of this contribution from Cornell University found the rate of change of α to β or β to α lactose to have a minimum value, whereas "the rate approaches infinity at pH 0.0 and 9.0." Further, "the effect of pH on the rate of change of α to β lactose was shown to influence the rate of solution of α lactose hydrate, and the effect of pH on the rate of change of β to α lactose was shown to influence the rate of precipitation of α lactose hydrate at 25° C." Even rather strong sucrose solutions, however, had little effect on the rate at which one form of lactose changed into the other.

In skim milk powder prepared by various methods the lactose was found to take the form of a noncrystalline equilibrium mixture of the α and β types when the freshly prepared product was held to a low moisture content. In the product of the flake process, however, some α lactose was found to have crystallized. The crystallization of α lactose hydrate is considered the final step in the caking of milk powder, a process which is believed to begin with absorption of moisture by the concentrated lactose sirup, followed next by adherence among the milk particles and then by the crystallization. The production of "sandy" ice cream is attributed also to the presence of unfrozen water in a quantity sufficient to permit the crystallization of α lactose hydrate.

The Hudson and Brown seeding test was shown to be useful for demonstrating the presence of crystalline α lactose in dairy products.

The sterols of ergot, M. C. Hart and F. W. Heyl (*Jour. Amer. Chem. Soc.*, *52* (*1930*), *No. 5*, *pp. 2013–2015*).—The association of fungisterol with the ergosterol of ergot was confirmed, and the presence of a third sterol was demonstrated. The fungisterol preparation had a melting point of 144 to 146° C., and the specific rotation $[\alpha]_D = -20°$. It yielded an acetate melting at 156 to 157°. The new sterol melted at 120 to 125°, had the specific rotation $[\alpha]_D = -2°$, and formed an acetate melting at 121 to 124°.

Some new esters of ergosterol, H. Emerson and F. W. Heyl (*Jour. Amer. Chem. Soc.*, *52* (*1930*), *No. 5*, *pp. 2015*, *2016*).—Ergosteryl acid phthalate, together with silver and copper salts, ergosteryl phenylurethan, and *m*- and *p*-nitrobenzoates have been prepared from the ergosterol of ergot, as well as the *m*- and *p*-nitrobenzoates and cloroacetate of isoergosterol.

Analyses of these compounds, and, in most cases, the melting points also and the specific rotations, are given.

Alpha-ergostenol and its isomerization to beta-ergostenol, M. C. Hart, J. H. Speer, and F. W. Heyl (*Jour. Amer. Chem. Soc.*, *52* (*1930*), *No. 5*, *pp. 2016–2019*).—α-Ergostenol prepared from ergot ergosterol was found to differ slightly in physical properties, and radically in ability to isomerize, from the α-ergostenol from yeast ergosterol. The effect of a number of acid halides in causing isomerization of α-ergostenol to β-ergostenol was investigated. "No single factor could be made to account for isomerization in some cases and not in others." A number of new esters of α- and of β-ergostenol are described.

The investigation of oils in ultra-violet light [trans. title], J. A. Pierce (*Ztschr. Untersuch. Lebensmtl., 59 (1930), No. 1, pp. 94–99*).—Trial was made of the effect of ultra-violet light upon 48 samples of olive oil examined under standardized conditions. The possibility of the detection of refined oil in unrefined oil was confirmed, but the theory that coloring matters are responsible for the fluorescence was not confirmed. The results were considered rather to depend upon the presence of a sterol.

The paper is a contribution from The Johns Hopkins University.

The effect of the mineral oil treatment on the composition of milk, M. B. MacDonald, E. C. Andes, and F. A. Briggs (*Jour. Home Econ., 22 (1930), No. 3, pp. 213–218*).—Determinations of various constants of the fat from untreated "onion" milk and of the same after the removal of the flavor and odor by the method noted previously (E. S. R., 57, p. 178), together with similar determinations of fresh and used mineral oils and of known mixtures of mineral oil and butterfat, gave no evidence of any deleterious effects upon milk resulting from treatment with the mineral oil.

Antimony trichloride color tests for vitamin A of butter from treated and untreated milk also showed no differences.

On the mode of combination of the iodine in Laminaria digitata [trans. title], G. Lunde and K. Closs (*Biochem. Ztschr., 219 (1930), No. 1–3, pp. 198–217*).—The iodine extractable from various parts of the fresh thallus of the alga by water, by alcohol, and by ether was determined, as were also the inorganically and organically combined iodine contents of the various fractions. The greater part of the iodine content was found in each case to be water-soluble and in an inorganic combination.

The production of ammonium phosphate [trans. title], S. Vol'fkovich (*Udobrenie i Urozhaĭ, No. 1 (1929), pp. 30–37, fig. 1*).—Phosphoric acid concentrations of 6 to 18 per cent of phosphoric anhydride could be used when the reactions were allowed to run in two stages according to the following equations:

1. $H_3PO_4 \cdot aq + 2NH_3 = NH_4H_2PO_4 + aq.$
2. $NH_4H_2PO_4 \cdot aq + 2NH_3 = (NH_4)_3PO_4 \cdot 3H_2O + aq.$

In the first stage mono- and some diammonium phosphate is formed, leaving behind some phosphoric acid. After filtering, the filtrate is saturated again with an excess of ammonia and the triammonium phosphate is obtained. By regulating the quantity of ammonia in the first stage, most of the sesquioxides are precipitated and the phosphates from the second stage are technically pure. The first stage, when made neutral to methyl red, leaves behind all of the sesquioxides. The triammonium phosphate, because of its instability, is treated (1) with a stream of hot air and the ammonia liberated is caught and utilized; (2) it is mixed with the products of the first stage; (3) it is mixed with the original phosphoric acid solution in the proportion to obtain mono- and diammonium phosphate; or (4) it is mixed with sulfuric acid. The author gives a drawing of a semicommercial plant unit for the production of ammonium phosphate by the method described, whereby the low grade phosphates could be used.

The thermic method of obtaining the phosphates of potash [trans. title], Ė. V. Britske, N. E. Pestov, and E. P. Pokhvalinskaia͡ (*Udobrenie i Urozhaĭ, No. 2 (1929), pp. 67–71, fig. 1*).—The authors present experiments on the interaction of potassium chloride and phosphoric acid with the idea of obtaining potassium phosphate. At temperatures ranging from 250 to 500° C. potassium chloride and phosphoric acid yielded various proportions of potassium phosphate. At 350° the solid phase contained 45.98 per cent of phosphoric anhydride, 48.44 per cent of potassium as oxide, and 12.46 per cent of chlorine. In the liquid phase there was no chlorine at temperatures ranging from 260 to 400°. By passing ammonia into the liquid a mixture of ammonium and potassium phosphates was obtained. A drawing and description of the apparatus used are given.

A new cycle of acidulating raw phosphates [trans. title], A. A. Sokolovskiĭ (*Udobrenie i Urozhaĭ, No. 3 (1929), pp. 146–150*).—The author describes experiments with various low grade phosphates from which ammonium and acid phosphates were produced by the method of Vol'fkovich and Kamzolkin.

An apparatus for the determination of corrected melting points [trans. title], C. Junge (*Chem. Ztg., 53 (1929), No. 103, p. 996, fig. 1*).—The ordinary melting point apparatus of the type providing for the circulation of the liquid by convection through a closed side-tube circuit was modified to provide a column of the heating liquid long enough to cover the entire mercury thread of the thermometer with that portion of the heating liquid column included in the circulation, with a view to the direct reading of corrected melting points.

On the determination of moisture by distillation with tetrachlorethane [trans. title], W. Lepper (*Ztschr. Untersuch. Lebensmtl., 59 (1930), No. 1, pp. 79–81*).—On account of its high boiling point (147° C.), tetrachlorethane should be tested with care as to its suitability for each substance to which it is to be applied in the immiscible liquid method for determining moisture. The author showed that in the case of sucrose decomposition of the sample took place and high results were obtained.

A rapid method for the determination of halogen in insoluble inorganic halides, R. H. Klein (*Analyst, 55 (1930), No. 648, pp. 192, 193*).—Triturate 0.5 gm. of the sample with 1 gm. of zinc dust and 10 cc. of water "until no more of the unchanged material is visible." Let the mixture stand about 10 minutes, decant the supernatant solution through a small filter, wash the insoluble material thoroughly, decanting the washings through the filter and adding them to the main filtrate; and titrate with N/10 silver nitrate solution, using potassium chromate as indicator.

This procedure, first applied for the determination of iodine in mercuric iodide, was found to give good results with lead chloride and with silver iodide. In the case of mercurous chloride, however, no variation of the conditions sufficed to secure concordant results.

[The determination of arsenic], T. von Fellenberg (*Biochem. Ztschr., 218 (1930), No. 4–6, pp. 283–317, figs. 3*).—In these two papers is given an account of the elaboration and application of a method for the volumetric determination of minute quantities of arsenic in foods and related preparations.

I. *A rapid micro method for the determination of arsenic in organic materials* [trans. title] (pp. 283–299).—Detailed account is given of a procedure consisting essentially in the destruction of organic matter with concentrated sulfuric acid and 30 per cent of hydrogen peroxide, distillation of the arsenic as the trichloride, the precipitation of the sulfide, which is either distilled off or separated by filtration, and titration in an alkaline solution with permanganate.

II. *On the arsenic content of foods and related products in the natural condition and after treatment with arsenicals* [trans. title] (pp. 300–317).—Applying the micro method above outlined to about 125 fruits sprayed with lead arsenate and 15 fruits treated with a copper arsenic combination, the author found from a few micrograms to 0.117 mg. per fruit. Sea products were found to contain larger proportions of arsenic, the highest figures being those of from 2 to 3 mg. in 100 gm. in edible Japanese algae. The conclusion is drawn that arsenic sprayed fruits could hardly give rise to arsenic poisoning. On the other hand, lead arsenate is considered a treatment to be avoided on account of the lead content of the spray, the substitution of calcium arsenate or other arsenicals being considered desirable.

The determination of small amounts of copper in the presence of iron, L. J. Chalk (*Analyst, 55 (1930), No. 648, pp. 187–191*).—By substituting tartaric acid solution for the acetic acid solution used by Elvehjem and Lindow (E. S. R., 61, p. 612), the author found it possible to determine minute quantities of copper by the colorimetric copper pyridine thiocyanate method. He proposes the following procedure:

The initial solution is to have a volume of 35 cc. and a copper content up to 0.1 mg. Make the solution slightly alkaline to phenolphthalein by the addition of N sodium hydroxide solution; then add N sulfuric acid sufficient to dissolve the ferric hydroxide to a clear solution, avoiding excess of the acid by adding 1 cc. at a time and letting the solution stand 5 minutes with occasional shaking between additions. Transfer the mixture to a 60-cc. separating cylinder of which the stem has been cut short and upon which a 50-cc. mark has been etched. Add 1 cc. of 10 per cent tartaric acid solution, 1 cc. of 10 per cent potassium thiocyanite solution, 0.5 cc. of pyridine, and 5 cc. (accurately measured) of chloroform. Make up the volume to 50 cc., shake about 15 seconds, and run off the chloroform layer into a 25-cc. Nessler tube for comparison with standards prepared in the same manner from solutions of known quantities of copper.

Cobalt interfered by the formation of a pink double thiocyanate, nickel gave a blue compound, and silver and mercurous salts caused precipitates which prevented accurate color comparisons. Lead and barium necessitated the use of hydrochloric acid in place of sulfuric acid. Antimony, bismuth, stannous and stannic tin, and titanium gave with sodium hydroxide precipitates soluble only with some difficulty in sulfuric acid (the last-named requiring heating to effect solution of the precipitate, followed by cooling before the addition of the tartaric acid), but gave no further trouble after having been redissolved. Cadmium, chromium, mercuric-mercury, manganese, uranium, and zinc did not interfere.

On a new procedure for the microdetermination of the calcium ion [trans. title], A. Astruc, M. Mousseron, and N. Bouissou (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 6, pp. 376, 377*).—The method depends on the precipitation of the calcium as tungstate, the separation of free tungstic acid from the calcium salt by acidifying with hydrochloric acid, and the reduction of the tungstic acid by titanous chloride, followed by the colorimetric comparison by means of the Duboscq colorimeter of the blue color produced with that of standards of known calcium equivalent.

Put the solution of the sample, in a quantity representing from 0.1 to 1.5 mg. of calcium, in a centrifuge tube. Dilute with distilled water to 7 cc.; add 1 cc. of 5 per cent sodium tungstate solution; shake gently, and heat at about 70 to 80° C. on the water bath for one hour. Centrifuge, and wash the precipitate two or three times with 5 cc. of distilled water. The last washing should give no blue color with the titanous chloride reagent.

Add three drops of concentrated hydrochloric acid, running the acid directly on to the washed centrifuge deposit, then add 0.5 cc. of distilled water. Heat 15 minutes on the boiling water bath, wash the tungstic acid precipitate by centrifugation and decantation with 2 cc. of N hydrochloric acid to remove final traces of calcium, and dissolve the tungstic acid in 2 cc. of 20 per cent potassium hydroxide solution. Make the solution just neutral with hydrochloric acid and add 0.3 cc. N hydrochloric acid, bring the volume of the solution exactly to 10 cc. with distilled water; add 0.3 cc. of the titanous chloride reagent, and compare with standards similarly prepared.

The titanium reagent is prepared by diluting the commercial 12 per cent solution to about 0.01 this concentration, titrating with a solution of a ferric salt and adjusting the dilution so that each cubic centimeter of the final reagent reduces 2 mg. of ferric iron.

The figures given indicate satisfactory recoveries of calcium in quantities of from 0.16 to 1.28 mg.

A study of methods for the determination of the available potassium of soils, L. C. Wheeting (*Soil Sci., 29 (1930), No. 1, pp. 1–21, figs. 3*).—Report is made from the Wisconsin Experiment Station of comparative experiments, including trials of the extracting capacities of distilled water, carbon dioxide solution, dilute solutions of citric acid and of ammonium chloride, and of steam, as well as of the seedling method of Neubauer (E. S. R., 50, p. 118). A variety of soils was used in each case.

"The Neubauer test evidently detects quite accurately the potassium deficiencies of soils." Also, "Neubauer tests modified to include fertilization were good indicators of the potassium needs of soils." Of the chemical solvents the ammonium chloride solution showed the closest similarity to the plant in its removal of available potassium; and "with normal ammonium chloride solution [which, as a leaching reagent, gave better results than did 10 per cent solutions used as single extraction solvents] the leaching method of extracting the available potassium of soils gives better results than the single extraction method. When a soil is leached with this solution the rate of solubility of the potassium is a constant for some time, but eventually becomes much slower. The conclusion is drawn that the first leachings remove the easily replaceable potassium, after which the slower rate of solubility is connected with the potassium compounds of low solubility. A relationship between the potassium dissolved from a soil by the first 200 cc. of leachate and that dissolved by a liter was established. This relationship may be used as a rapid means of determining the total replaceable or available potassium in soils."

Neither water nor aqueous carbon dioxide gave reliable indications of the available potassium. A 1 per cent solution of citric acid did not equal ammonium chloride solution, "because it does not show sufficient differences between goods and poor soils." The use of the citric acid solution in conjunction with steam under pressure appeared no better than that of the citric acid solution alone; and steam alone gave no consistent indications of the soil potassium needs.

On the precipitation of proteins with ferric hydroxide sol, I [trans. title], G. Lunde and K. Wülfert (*Biochem. Ztschr., 219 (1930), No. 1–3, pp. 171–185, figs. 6*).—The sol of hydrated ferric oxide (dialyzed iron) was found to show a highly specific reaction with ampholytic colloids, and to be applicable, therefore, for the characterization and the fractional precipitation of proteins in cases in which other methods do not serve the purpose.

The estimation of the cystine content of proteins by a colorimetric method [trans. title], A. Blankenstein (*Biochem. Ztschr., 218 (1930), No. 4–6, pp. 321–330*).—From 0.5 to 1 gm. of the protein is to be boiled with from 15 to 20 cc. of 20 per cent of sulfuric acid under reflux for 12 hours, the hydrolyzate then to be shaken up in the same flask with kaolin and to be filtered off into a 50-cc. graduated flask. Wash with small quantities of N sulfuric acid until the volume of the filtrate and washings amounts to 50 cc. Prepare a standard solution from 20 cc. of a 0.1 per cent solution of cystine in N sulfuric acid by adding 30 cc. of a 20 per cent by volume sulfuric acid solution and 50 cc. of N sulfuric acid. To 10-cc. aliquots of this standard and of the volumetric dilution of the protein hydrolyzate add 6 cc. of ammonia (Ammoniak—triplex) and 5 cc. of 0.02 N potassium cyanide solution in a 25-cc. volumetric flask, shake, and heat 15 minutes in a boiling water bath. To avoid the spraying out of the contents, place a small funnel on each of the volumetric flasks. Cool the flasks with running water; complete the volume to exactly 25 cc. with the ammonia after adding from 6 to 8 drops of a freshly prepared 5 per cent sodium nitroprusside solution; and calculate the cystine content of the sample from the color intensities of sample solution and standard as determined by a colorimeter. An example of this computation is given.

On the influence of the reaction upon the oxidation of amino acids on animal charcoal [trans. title], M. GRADWOHL (*Biochem. Ztschr.*, *219* (*1930*), *No. 1-3*, *pp. 136-144*).—Increasing alkalinity was accompanied by a marked increase in the rate of oxidation of amino acids in contact with animal charcoal. The adsorption of glycine by the charcoal was found practically independent of the reaction. The oxygen consumption in an animal charcoal-glycine suspension was found decidedly greater in an alkaline than in an acid solution; but the quantity of the amino acid which disappeared remained practically the same. Oxygen consumption and carbon dioxide production having been determined simultaneously, oxidation quotients were calculated. These had the values 0.81 for the acid solution, 2.27 for the alkaline. The carbon dioxide production in the alkaline solution was thus shown to exceed markedly the increase in oxygen consumption, indicating the occurrence of two distinct types of oxidation mechanism.

A chemical method for the quantitative determination of choline, and some physicochemical data on choline and its salts [trans. title], W. ROMAN (*Biochem. Ztschr.*, *219* (*1930*), *No. 1-3*, *pp. 218-231*, *figs. 2*).—Report is made of a method found capable of determining choline in solutions containing from 5 micrograms to 5 mg. with a maximal range of error of ±5 per cent, the determination depending on the precipitation of the choline by iodine as the periodide, followed by the titrimetric determination of the iodine with sodium thiosulfate.

Various properties of choline more or less related to its quantitative determination were also investigated. The results of this work included the observation that whereas pure, dry choline is decomposed even at 40° C. in vacuo, solutions either of the base itself or of the chloride are little affected by temperatures up to 70°.

The biological estimation of glucose.—I, A study of factors influencing changes in H-ion concentration of media, A. LEVESCONTE, J. H. BUCHANAN, and M. LEVINE (*Iowa State Col. Jour. Sci.*, *4* (*1930*), *No. 3*, *pp. 331-342*, *figs. 7*).—The rate of lowering of the pH of media containing over 0.01 per cent glucose when inoculated with *Aerobacter levans* was not proportional to the glucose concentration. The secondary change, under aerobic conditions, was an increase in pH due to the destruction of the acids formed from the sugar, and was a function of the glucose concentration. Under anaerobic conditions there was no destruction of acids, and the total pH change was a function of the glucose concentration. When the glucose concentration was less than 0.01 per cent, and the buffer value was low, the initial lowering of pH was a function of the glucose concentration. Media varying from 0.002 to 0.4 per cent in glucose concentration were studied by varying the buffer value.

The results were considered to demonstrate a possibility of determining glucose and other sugars in small concentration by a biological method.

The titrimetric determination of lactose in milk [trans. title], H. Gohr (*Ztschr. Untersuch. Lebensmtl., 59 (1930), No. 1, pp. 90–94*).—The principle of the method proposed is that of the oxidation of the lactose, in a sample of the milk free from fat and from protein, with an excess of 0.05 N solution of potassium ferricyanide, this reaction being carried out by heat in the presence of sodium carbonate. The excess of the oxidant is determined by adding a soluble iodide and titrating the free iodine with thiosulfate. A table shows the lactose equivalents of quantities of the 0.05 ferricyanide solution in steps of 0.1 cc. from 0.6 to 9.9 cc. Full details of the preparation and analysis of the sample are given.

SOILS—FERTILIZERS

[Soil investigations], J. C. Ripperton and C. Richter (*Hawaii Sta. Rpt. 1929, pp. 25–28*).—Soil investigations are reported under three captions.

Survey of the soils of the Kona district.—"The soils of Kona are relatively young. They are largely residual and are the result of the decomposition of lava flows which are mostly of the 'a–a' type. In some places decomposition of the lava is at a more advanced stage than in others, the soil being deep and fine in texture. In general, however, decomposition is in the early stages; the soil is shallow, and the undecomposed lava is often apparent at the surface. It is a striking fact that the coffee trees make thrifty and vigorous growth on what appears to be practically undecomposed lava. The soil profile generally shows no pronounced difference in color texture even in the deeper soils." There were found a fine-textured type having a very yellow subsoil of heavy texture; a black soil, the most frequently occurring type, of loose texture, and grading into a dark brown subsoil of similar texture; and a soil considered a possible third type, yellow and of generally poor fertility, said to be associated with a different type of lava.

It is considered, further, that "because of the fact that decomposition is yet in the early stages, and the roots of plants penetrate through the shallow soil into the lava itself, differences in the lava and its decomposition products probably bear a close relationship to the nature and fertility of the soil."

Colloidal soil investigations.—Experiments with dispersion mechanisms and with chemical aids to dispersion indicate that "(1) the electrical stirring device is far superior to the other means; (2) the destruction of the soil organic matter by means of hydrogen peroxide is unnecessary even in soils containing 10 to 12 per cent organic matter; (3) the washing out of the calcium before dispersion is desirable with numerous soils, but twentieth normal hydrochloric acid solution is just as efficient for this purpose as fifth normal acid; (4) hot digestion is not necessary; and (5) the addition of the hydroxyl ions for the stabilization of the charge on the colloidal particles is most efficiently done in the form of sodium hydroxide or sodium carbonate. In some soil samples almost complete dispersion was obtained with the aid of chemicals." After as complete a dispersion as could be had the colloids were separated by means of the supercentrifuge and, to separate the "ultra-clay" fraction, a Pasteur-Chamberland filter. The colloids thus separated were purified by electrodialysis.

In some samples more than 1 per cent of ultra-clay was found.

Miscellaneous notes.—The specific gravity of the Hawaiian soils examined was found to range from 2.19 to 3.36, the variations appearing to depend upon those of the proportions of organic matter and of sesquioxides present. "Organic matter has a specific gravity of about 1.2 while that of the sesquioxides is about 5.3." Moisture equivalents were determined, and it was found that "the platted values run parallel with those of the hygroscopic coefficient and the moisture adsorbed in a saturated atmosphere."

Analyses of soils upon which a wilting of alfalfa had been observed indicated toxic accumulations of salt, "presumably from the irrigation water, which contains as much as 75 grains of sodium chloride per gallon."

[Soil fertility studies at the New Hampshire Station] (*New Hampshire Sta. Bul. 250 (1930), pp. 22–25*).—This work has included 5 series of investigations under the supervision of F. S. Prince and T. G. Phillips.

On neglected hay lands.—"It is now evident that the available phosphorus content of this soil is ample for the normal production of timothy hay after a stand once has been secured. When used together, nitrate of soda and superphosphate gave a significant increase, but this response is in the main due to the nitrogen rather than the phosphorus in the mixture." Where the soil had not been manured sodium nitrate alone gave significant increases, but superphosphate was shown not to be needed either on the manured or on the unmanured plats.

Fertilizing alfalfa.—Various treatments with mineral fertilizers, lime, and manure, applied alone about May 1, 1929, produced significant increases in the quantity of the first and second cuttings of alfalfa. The second cuttings were shown to have a protein content from 2 to 4 per cent higher than that of the first cuttings.

Fertilizing sweetclover.—Various combinations of superphosphate, manure, limestone, and potassium chloride were shown to be of value.

Fertilizing potatoes in rotation.—In a 60-plat investigation of the rotation of potatoes, oats, and clover and timothy, conducted near Colebrook, the results obtained indicated phosphatic and potassic fertilizers as of more importance than nitrogen. Potash in excess of that furnished by 1-ton applications of fertilizer of 7 per cent potash content was found not necessary. Both 4- and 2-ton applications of limestone increased the clover-timothy yield significantly.

Potatoes need potash.—An experiment of F. W. Taylor indicates the need for potash, in growing potatoes on old, neglected lands, up to 10 per cent in the mixture, the rate of application having been 1,500 lbs. to the acre. On lands in a good state of fertility from 3 to 6 per cent of potash in the mixture was found ample. The soil showing the higher potash requirement was a sandy loam sod which had not been plowed, manured, or fertilized for 20 years Yields up to 266.5 bu. an acre with a 4–8–10 mixture were obtained on this land, as against check plat yields of but 168.7 bu.

Method of applying fertilizer to potatoes.—"For the third consecutive year placing the fertilizer widely in the row with the seed at planting time has given better results than placing above, below, or at the side of the seed."

Manure proves worth in potatoes.—Manure applied at the rate of 12 tons to the acre was shown to be worth $3.75 a ton. The findings of the experiment were in accord with the general theory that frequent light applications of manure are more profitable than are infrequent heavy applications.

Nitrate v. sulfate in fertilizing potatoes.—Two years of results of tests of the relative effectiveness of nitrate and sulfate fertilizers as a source of inorganic nitrogen for potatoes indicate, from the standpoints both of total yield and size of tubers, that sulfate alone is not quite as desirable as nitrate alone and that neither alone is as good as a mixture of the two. The plats treated with the mixture yielded 10 bu. more to the acre than the nitrate plats and 12 bu. more than the sulfate plats.

[Soil fertility experiments at the Washington Station] (*Washington Col. Sta. Bul. 237 (1929), pp. 17–19, 47*).—These pages contain the following items:

The maintenance of organic matter in eastern Washington soils, S. C. Vandecaveye and H. F. Holtz.—Field plat work indicates that "the efficiency of nitrogen fertilizers is better in years of high rainfall than in years of low rainfall. Alfalfa sod gives higher yields of wheat for approximately as many years as the alfalfa crop has been grown on the land. There seems to be a wide variation in the nitrate content of the cell sap of different varieties in the various stages of development. Some varieties have a much wider adaptation than others to the conditions brought about by alfalfa sod, summer fallow, and continuous wheat."

Fertility investigations of Washington soils, H. F. Holtz and S. C. Vandecaveye.—Fertilizer trials have been increased in number to 70 and in soil variety to cover 39 types. "Practically every soil type responded to some form of fertilizer. In the majority of cases, nitrogen seems to be the first limiting plant food, followed closely by phosphorus."

Changes occurring in the irrigated soils as a result of irrigation, cropping, and of fertilizer treatments, S. C. Vandecaveye and H. F. Holtz.—The authors report the completion of preliminary analytical and detailed soil profile studies. Also, "the plats which have received nitrogen, nitrogen and phosphate, phosphate and potash, and complete fertilizers for the last three years showed marked increases in yields of the 1929 crops in the nitrogen, nitrogen and phosphate, and complete fertilizer plats. The phosphate and potash plats did not show any beneficial results. The nitrogen and phosphate plats gave better yields and better colored fruit than the nitrogen plats. The results thus far obtained indicate that nitrogen and phosphorus are the two limiting factors in this soil."

Tillage and soil moisture problems, H. M. Wanser.—The work indicated essentially that "the results of the last two winters show the mulch retards 'run-off' but whether it acts as an aid in conserving moisture or not depends on the character of the winter's precipitation."

Diurnal, average, and seasonal soil temperature changes at Davis, California, A. Smith (*Soil Sci., 28 (1929), No. 6, pp. 457–468, figs. 4*).—Data of the character indicated were recorded for the period February 20 to September 30, 1925, and for the period January 1 to June 18, 1927, the work having been done in a manner very similar to that noted in detail from an earlier paper (E. S. R., 61, p. 418).

"The average temperatures for the air, 0.5- and 36-in. depths, are shown graphically for both the 1925 and 1927 periods. The parallelism of the air and the 0.5-in. soil depth temperatures is well shown, and the data of the soil temperatures at a depth of 36 in. produce a smoother curve.

"A comparison of the midday and late (5 p. m.) afternoon air temperatures was made to show that during a period such as a month the differences are slight (1.5° [F.] higher at noon), but that on certain days the 5 p. m. readings were as much as 8° cooler and on other days 10° warmer than the noon readings."

Soil profile studies.—II, Methods used in the profile survey of New Jersey soils, J. S. Joffe and L. L. Lee (*Soil Sci., 28 (1929), No. 6, pp. 469–479, pl. 1, fig. 1*).—This paper, from the New Jersey Experiment Stations, continues a series opened by a general review already noted (E. S. R., 62, p. 410).

Under the captions (1) choice of locality for making the soil cut, (2) digging the soil cut, and (3) examination of the morphological features, there is presented a discussion of the advantages of studying soils "in their profile make-up," as against the older procedure of an examination of samples taken at arbitrary depths. The methods of making the observations on the morphological features and of recording them are discussed under the headings of constitution, habitus of the profile, depth of profile and thickness of respective horizons, texture of soil material, color of soil, structure, concretions and foreign intrusions, and miscellaneous observations such as depth of root penetration and distribution of organic matter.

The laws of soil colloidal behavior.—II, Cataphoresis, flocculation, and dispersion, S. Mattson (*Soil Sci., 28 (1929), No. 5, pp. 373–409, figs. 2*).—An experimental study of the flocculation and cataphoresis, as observed in solutions of various electrolytes and mixtures of electrolytes, of bentonite, and of soil colloids having various silica sesquioxide ratios and exchange capacities is here presented, in conjunction with a rather full discussion of the theoretical bearing of the findings, as the second of the New Jersey Experiment Stations papers of this series (E. S. R., 62, p. 410). Among numerous conclusions and inferences developed from the data reported those following may be taken as partially representative:

"The charge and stability of the colloid depend upon the degree of dissociation of the exchangeable ions, which varies with their valence, hydration, potential," and with other factors. "The quantity and quality of the exchangeable ions determine, through their various degrees of dissociation, the colloidal behaviors such as charge, osmotic hydration sensitivity to electrolytes, and dispersibility, that is, the size of the particles as determined by molecular aggregation."

"The osmotic hydration is the most potent stability factor. Thus the concentration required a flocculate a Na-saturated colloid having a high exchange capacity, which means a high osmotic hydration, is very much higher than in the case of a Na-saturated colloid with a low exchange capacity, although the initial charge may be the sme. This difference in stability vanishes if the colloids are dehydrated with alcohol, in which condition they become extremely sensitive to electrolytes.

"Although dispersion and particle size are held to be closely related to the charge, it is very doubtful whether the stability of the micelles depends upon a mutual repulsion. The osmotic hydration of the micelles is sufficient to account for the stability of a suspension. Since this hydration depends upon the number of dissociated ions, the connection between a high charge and the stability of a suspension, which is often observed but which is not general, is seen as an indirect effect."

Reactions of electrodialyzed humus and bentonite and application of the method, A. O. Alben (*Jour. Amer. Soc. Agron., 22 (1930), No. 4, pp. 311–326, figs. 12*).—This contribution from the Iowa State College takes up two groups of experiments of which the first, comparing the reactions of electrodialyzed humus with those of bentonite similarly treated, showed the humus preparation used to have an adsorptive capacity about seven times that of the bentonite. The humus was found to react with calcium hydroxide and with the hydrated oxides of iron and of aluminum. The bentonite reacted with ammonium, sodium, and calcium hydroxides, as well, also, as with ferrous oxide, but did not react with the hydrated oxide of aluminum.

The second group of experiments, consisting essentially in the application of the electrodialytic method to a number of soils, led to the observations, among others, that in the case of one of the soils (Tama silt loam) a final pH value of 2.04 was reached; and that in 60 days, whether the soils were held in water or were permitted to dry out, the pH value had reverted approximately to 4.0.

The electrodialysis of a basic soil (Webster silt loam, initially of a pH value of 7.7) was also studied, but with results considered less promising. Displacement solution methods for basic soils are described as not entirely satisfactory on account of the difficulty of determining what proportion of the extracted bases originated from soluble carbonates; but electrodialysis also failed to promise a satisfactory method for soils containing carbonates, since the carbonates were decomposed by the current, and "it takes too long a time to reach the end point [225 hours for the Webster silt loam as against 45 to reach the same point with Clinton silt loam, initial reaction pH 6.0] for the method to be of practical value."

Extraction of adsorbed cations from soil by electrodialysis, B. D. Wilson (*Soil Sci., 28 (1929), No. 6, pp. 411–421*).—This contribution from Cornell University presents the results of experiments consisting essentially in the addition to electrodialyzed soils and to soils both electrodialyzed and subsequently made alkaline by treatment with calcium acetate or with magnesium acetate, of the acetates of potassium, calcium, magnesium, and aluminum, with the subsequent study of the rapidity and comparative extent of the recovery by electrodialysis of the added cations.

The degree to which the cations were extracted from the soil when in either of the states mentioned was essentially the same. When each cation was adsorbed to the exclusion of the others, potassium and calcium were recovered by electrodialysis in equivalent quantities and to a considerably greater degree than was magnesium. "This occurred in spite of the fact that the soil adsorbed as much magnesium as it did potassium or calcium.

"Aluminum was adsorbed by the soil when its alumino-silicic complex was saturated with hydrogen or with calcium, but only minute quantities of it could be extracted by electrodialysis. The manner in which it was adsorbed is not clear, but it appears that under certain conditions it might become a part of the alumino-silicic complex of the soil.

"Potassium, calcium, and magnesium added to electrodialyzed soil in molecular equivalent quantities were extracted, collectively, to the extent that each of them was extracted when adsorbed individually. When they were adsorbed in the presence of one another more potassium was adsorbed than calcium, and more calcium than magnesium. The ease of their recovery, by electrodialysis, was in the same order as the magnitude of their adsorption."

Dehydration and soil acidity, H. G. Coles and C. G. T. Morison (*Soil Sci., 29 (1930), No. 1, pp. 59–70, figs. 3*).—This is a contribution from the University of Oxford, England.

All of the mineral soils examined were found to decrease considerably in pH value on removal of such water as could be driven off by a temperature of 98° C., a slight decrease following further heating. The changes in the mineral soils were reversible. Two soils which had been saturated with bases showed a decrease in pH on drying; but when soils were deprived of all exchangeable bases by extraction with dilute hydrochloric acid, heating produced no appreciable pH change. Similarly, when the base-free soils were supplied with exchangeable bases by treatment with solutions of various metallic cations, "all showed a considerable decrease in pH after being dried at 98°." After drying, the soils contained less of exchangeable bases than did the original moist soils, but showed increases in their contents of water-soluble calcium, potassium, and the phosphate ion. Alkaline soils showed changes greater than those of the more acid soils.

"The increase in acidity was caused by some change in the physicochemically absorbed bases. The alternative to this was that partial dehydration of the soil colloids released some of the physically absorbed compounds, and if these were of an acid nature they could cause the observed results."

Properties of soils which influence soil erosion, H. E. MIDDLETON (*U. S. Dept. Agr., Tech. Bul. 178 (1930), pp. 16*).—Certain of the physical and chemical properties of three soil types classed as erosive and of three types classed as nonerosive were studied and compared. "The properties having the greatest influence on soil erosion are indicated by the dispersion ratio, the ratio of colloid to moisture equivalent, the erosion ratio, and the silica-sesquioxide ratio."

The highest dispersion ratio found among the nonerosive types was 15.1, the lowest among the erosive types 13.0. "It is probable that on the basis of this property alone soils with a dispersion ratio of less than 15 may safely be classed as nonerosive." The ratio of colloid to moisture equivalent was in every case high among the nonerosive soils (approximately 1.5 or higher), "and no erosive soil has shown a ratio as high as 1.5. However, the greatest significance of the ratio of colloid to moisture equivalent is in its relation to the erosion ratio."

Further, "the erosion ratio is even more significant than the dispersion ratio, because it involves two additional factors which have an important bearing on erosion, the quantity and the character of the colloid. The erosion ratio is an indication of the erosiveness of soils under similar field conditions. It does not necessarily indicate the relative degree of erosion of soils which are subject to different conditions of topography and climate, particularly temperature and quantity and periodicity of rainfall. This, in part, accounts for the lack of correlation between the erosion ratio and the extent of erosion on the experiment station soils."

Research in regional peat investigations, A. P. DACHNOWSKI-STOKES (*Jour. Amer. Soc. Agron., 22 (1930), No. 4, pp. 352–366, fig. 1*).—"The object of this paper has been to call attention to the main lines of work that are under consideration or await further study, rather than to present results." It is a contribution from the U. S. D. A. Bureau of Chemistry and Soils.

The microflora of leached alkali soils, I, II, J. D. GREAVES (*Soil Sci., 28 (1929), No. 5, pp. 341–346; 29 (1930), No. 1, pp. 79–83*).—These two papers from the Utah Experiment Station show comparative results, with respect to the microflora, of the artificial salinization and subsequent leaching of a fertile soil and of the leaching of an almost totally barren, naturally saline soil.

I. *Synthetic alkali soil.*—A synthetic saline, or "alkali," soil was produced by the addition to a naturally productive sandy loam of 0.66 per cent each of sodium chloride, sodium sulfate, and sodium carbonate, followed by maintenance at 20 per cent moisture content for two months to permit the soil reaction to come to equilibrium. Leaching was then begun, and was found to have removed 91.3 per cent of the sodium chloride, 97.7 per cent of the sodium sulfate, and 43 per cent of the sodium carbonate at the end of a period of 199 days.

"The leaching had increased the bacteria 287 per cent; the ammonifying powers, 336 per cent; the nitrifying powers, 3,850 per cent; and the nitrogen-fixing powers, 857 per cent."

"Sixteen organisms were obtained in pure culture. Of this number 12 fixed nitrogen. The nitrogen-fixing ability of these varied from 1.4 mg. to 7 mg. Seven fixed over 4 mg. in the 5-week incubation period on sterile soil to which 2.5 per cent mannitol had been added. Of the 16, 12 produced over 5 mg. of ammonia in 4 days on a 1 per cent peptone solution. It was found that 5 of the organisms decomposed urea, whereas not one decomposed cellulose."

II. *A leached sodium-chloride soil.*—A naturally saline soil, practically devoid of vegetation and yielding as its principal salt content 379 gm. of sodium chloride and 6 gm. of sodium sulfate from 10 kg. of the soil, was leached 211 days and its flora plated on various media after the harvest of a second crop of barley.

As a result, 31 organisms were isolated in pure cultures and 11 of these were found capable of nitrogen fixation, producing increases of from 1.4 to 7 mg. of nitrogen in 100 gm. of soil. All but two of the organisms produced ammonia, 13 of them giving "over 5 mg. of ammonia in four days when grown in a 1 per cent peptone solution." Cellulose was decomposed by one of the organisms, urea by six forms.

Can Bacterium radicicola assimilate nitrogen in the absence of the host plant? M. P. Löhnis (*Soil Sci., 29 (1930), No. 1, pp. 37–57, fig. 1*).—Detailed report is made of an investigation begun at the University of Wisconsin and concluded at the Technical University of Delft, Netherlands.

It was found that in the media studied, *B. radicicola* was unable to fix any atmospheric nitrogen. It is probable that results which have been reported as positive by former investigators are to be ascribed to a loss of nitrogen from the nutrient medium. All evidence available points to the inability of *B. radicicola* to fix nitrogen in the absence of the host plant."

Studies of nitrogen fixation by the root nodule bacteria of the Leguminosae, E. W. Hopkins (*Soil Sci., 28 (1929), No. 6, pp. 433–447*).—The paper noted is a contribution from the Wisconsin Experiment Station presenting the experimental observation that "from more than 500 total nitrogen analyses it is obvious that nitrogen is not fixed by any of . . . 12 different cultures of Rhizobia under the conditions prevailing in these experiments."

The organisms were grown in a soil extract to which was added 1 per cent either of glucose or of sucrose, and from 0.05 to 0.1 per cent of dipotassium hydrogen phosphate. From 5.4 to 36.0 per cent of the added sugar was destroyed during the growth of the cultures. Pure cultures only were used. The Gunning total nitrogen method, modified to include nitrates, indicated the fixation of as much as 2.5 mg. of nitrogen in 100 cc.; but the Davisson-Parsons method (E. S. R., 40, p. 711), considered more reliable for the determination of total nitrogen with the inclusion of nitrates, "gave evidence of no fixation in amounts beyond the limit of experimental error." Further, "alfalfa 100 and soybean 501 and 504 consistently gave a loss of 0.1 to 1.7 mg. of nitrogen to 100 cc."

A reference list of over 50 titles accompanies the paper.

Composition and nitrification studies on Crotalaria striata, W. A. Leukel, R. M. Barnette, and J. B. Hester (*Soil Sci., 28 (1929), No. 5, pp. 347–371, figs. 6*).—"In any growth stage there is a progressive decrease in percentage of nitrogen in the complete plant and its separate parts in the following order: Leaves, complete plant, stems, and roots. There is a progressive increase in the percentage of cellulose and lignin in the order—leaves, complete plant, stems, roots. The carbohydrate percentage in the plant and its parts was rather constant. This resulted in a narrow ratio between total nitrogen and carbohydrates and cellulose for the leaves, which gradually widened in the complete plant, stems, and roots, respectively."

When the plant or its separated parts were incorporated into the soil the resulting accumulation of nitrates was found to be "most rapid from the leaves, progressively decreasing from the complete plant, stems, and roots in the order named, except with the leaves in the late fall stage, which varied little from that of the complete plant. The stems and roots show a utilization of the nitrate nitrogen of the soil in the early stages of decomposition. There is relatively little variation in the percentages of nitrogen and carbohydrates in the leaves of the plant through the successive growth stages, but there is some increase in the percentages of lignin and cellulose as the plant approaches maturity."

The article is a communication from the Florida Experiment Station.

Nitrate changes in a fertile soil as influenced by sodium nitrate and ammonium sulfate, N. Porges (*Soil Sci., 28 (1929), No. 6, pp. 449–455, fig. 1*).—Fertile soils were treated with sodium nitrate and with ammonium sulfate, in the experiments recorded in this communication from the New Jersey Experiment Stations, and their nitrate nitrogen contents, as affected by keeping the soils under varying conditions, were determined.

The incubation of the soil was found to increase the nitrate content; however, "this is not a continuous increase but is either more or less than the amount of nitrogen added as a fertilizer." A part of the added nitrogen was found to be converted rapidly into a form not readily leached but later reconverted into available forms.

"The nitrogen in the crop and in the leachings is less than the total nitrogen originally available. Of the available nitrogen, 22.5 to 30.4 per cent is retained in the soil. In the soils not undergoing leaching a similar retention of the nitrogen occurs. The addition of $NaNO_3$ and $(NH_4)_2SO_4$ mineralizes a part of the soil nitrogen. Even on fertile soils, additions of $NaNO_3$ and of $(NH_4)_2SO_4$ influence plant growth. The plant has a depressive influence upon the accumulation of nitrates in the soil."

The effect of phosphate and lime upon the rate curve of solubility of phosphorus from a Wooster silt loam soil, R. H. Simon (*Soil Sci., 29 (1930), No. 1, pp. 71–78, figs. 2*).—"The rate curves of two extremes of cropping of a Wooster silt loam soil are shown to diverge from the curves of the original uncropped soil. The greatest change in slope appears for a highly fertilized and limed soil of a 4-year rotation known as the Variety Test Tract. It is evident that the phosphorus is retained in this soil in an effective combination, which has produced high yields, and that it remains in a soluble form, which is indicated by the position of the rate curves toward the abscissa or approaching the curve for calcium phosphate. The curve for superphosphate with lime in a 5-year rotation is found to the right of the curve for the original soil, but the divergence is small when compared to the curve of the highly fertilized and manured soil. There is too wide a difference in fertilizer treatment in the two rotations to ascribe the difference to manure entirely.

"The curve for the unfertilized continuous corn soil is found beyond the curve of the original soil toward the ordinate, likewise the curve for the unfertilized plat of the 5-year rotation lies nearest the ordinate, or the region of least soluble phosphorus which is combined with iron and aluminum."

The fixation of phosphate by a peat soil, J. L. Doughty (*Soil Sci., 29 (1930), No. 1, pp. 23–35, figs. 10*).—Both precipitation and "physical adsorption" are considered to have played a part in the removal of phosphate from solution in the experiments here reported from the California Experiment Station. "Although the formation of iron, aluminum, and calcium phosphates will account for the fixation above pH 2 there is considerable fixation below this point." Further, "leaching with twentieth-normal hydrochloric acid, which should remove all of the reactive iron, aluminum, and calcium, caused a loss of the power of fixation, except below pH 5. Any fixation that took place in the acid-leached material must have been due to physical adsorption."

The water-soluble calcium only was found capable of precipitating phosphate in the presence of the peat. The calcium content of the replaceable base complex was without effect "even when the complex was saturated with it."

Soluble calcium and phosphate having been found in an alkaline medium at the same time, it was concluded that "the presence of the organic material prevented some of the water-soluble calcium from uniting with phosphate." The leaching of the peat either with ferric chloride or with aluminum chloride solutions brought about "a decided increase" in the quantity of the phosphate ion fixed, the procedure being "equally effective despite the previous leaching of the peat with water or hydrochloric acid. A study of the solubility of ferric phosphate at various pH values indicated a behavior somewhat similar to that of peat leached with ferric chloride."

"There is considerable evidence that the solid phase material exerts an appreciable effect upon the fixation of phosphate in all cases. The various cations when removed from the peat by leaching with water or hydrochloric acid react in the same way when phosphate is added as do the pure compounds of the aforementioned ions. In the material studied the formation of iron, aluminum, and calcium phosphates will account for the fixation of phosphate under field conditions."

Phosphorus assimilation by certain soil molds, P. E. Brown and F. B. Smith (*Iowa State Col. Jour. Sci., 4 (1930), No. 3, pp. 325–330*).—"Twenty cultures of molds were incubated in solution and in soil cultures for 45, 71, or 60 days. With two exceptions, the organisms showed a definite ability to assimilate phosphorus. *Tetracoccosporium paxianum* in solution culture gave an increase in water-soluble phosphorus, all the others showing a decrease or a phosphate assimilation. Possibly that organism also assimilated soluble phosphorus, but the effect in producing soluble phosphorus may have been unusually great, exceeding its assimilating power. One organism, *Penicillium vinaceum*, had no assimilating power in the soil culture test."

The part played by sulfur in the formation of soils capable of supporting plant life [trans. title], L. Rigotard (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 3, pp. 199–201*).—The author finds sulfur to take part in the disintegration of the rock, in which it most often occurs in the form of sulfides; in the chemical modification of the rocks; and in the development of organisms which contribute importantly to the formation of arable soils.

The value of raw sewage sludge as fertilizer, J. F. Muller (*Soil Sci., 28 (1929), No. 6, pp. 423–432*).—Analyses of dried samples of the fresh sludge and pot tests to determine the actual effect of the material applied as a fertilizer are here reported from the New Jersey Experiment Stations. The analyses indicate the presence of appreciable plant food value. The dried sludge, when applied alone to grass grown on sand, gave a good stand and prevented the grass from dying off; and the application of the sludge yielded an important increase in the water-holding capacity of a sandy soil.

The addition of nitrogen, however, to the extent of bringing the carbon-nitrogen ratio below 8, together with phosphate supplementation and small additional quantities of potash appeared to be needed; and "although the experiments reported did not indicate a marked necessity of using lime with the sludge, it is almost certain that lime would be required after several years continuous application of sludge."

AGRICULTURAL BOTANY

The raw materials of the plant kingdom, I, II, J. von Wiesner (*Die Rohstoffe des Pflanzenreichs. Leipzig: W. Engelmann, 4. ed., 1927, vol. 1, pp. IV+1122, figs. 307; 1928, vol. 2, pp. III+1123–2253, figs. 217*).—This, the fourth edition of the work previously noted (E. S. R., 39, p. 430), now edited by P. Krais and W. von Brehmer, has been produced under the collaboration of F. Boas et al.

The plant as a colloidal system [trans. title], F. Boas (*Naturw. u. Landw.* [*Freising*], *No. 14* (*1928*), *pp. 141, figs. 24*).—The 28 sections of this account are followed by a bibliography containing 239 references to literature.

The influence on yeast cells of growth-promoting substances having the character of vitamin D [trans. title], H. Lacroix (*Centbl. Bakt.* [*etc.*], *2. Abt., 76* (*1929*), *No. 25–26, pp. 417–428*).—Details are given of work and results as to adsorption and growth in a mineral solution.

Darwinism versus Lamarckism, W. P. Pycraft (*Sci. Prog.* [*London*], *24* (*1930*), *No. 95, pp. 441–450*).—It is pointed out that the inheritance of characters developing or atrophying from use and disuse appears to play as important a part in evaluation as natural selection.

GENETICS

Contributions to the genetics of Drosophila simulans and Drosophila melanogaster, A. G. Sturtevant, C. B. Bridges, T. H. Morgan, L. V. Morgan, and J. C. Li (*Carnegie Inst. Wash. Pub. 399* (*1929*), *pp. 296, figs. 14*).—Further studies of the genetics of these two species are reported in the following papers: The Genetics of *Drosophila simulans*, by A. H. Sturtevant (pp. 1–62); Variation in Crossing Over in Relation to Age of Female in *Drosophila melanogaster*, by C. B. Bridges (pp. 63–89); Deficient Regions of Notches in *Drosophila melanogaster*, by J. C. Li and C. B. Bridges (pp. 91–99); Exceptional Sex-Ratios in Certain Mutant Stocks with Attached X's (pp. 101–138), Variability of Eyeless (pp. 139–168), Data Relating to Six Mutants of Drosophila (pp. 169–199), and Experiments with Drosophila (pp. 201–222), all by T. H. Morgan; and Composites of *Drosophila melanogaster*, by L. V. Morgan (pp. 223–296).

Proof that the entire chromosome is not eliminated in the production of somatic variations by X-rays in Drosophila, J. T. Patterson (*Genetics, 15* (*1930*), *No. 2, pp. 141–149, fig. 1*).—Genetic evidence is presented to show that somatic variations induced in Drosophila by X-rays may be the result of the loss of a part of a chromosome as well as the effect of gene mutations or the loss of the entire chromosome from the somatic cells. In these studies the larvae X-rayed were produced by crossing red-eyed females having a portion of a chromosome carrying a factor for gray body attached to the X chromosomes with yellow white singed males.

Constant breeding hybrids resulting from the doubling of the chromosomes [trans title], G. D. Karpetschenko (*Züchter, 1* (*1929*), *No. 5, pp. 133–140, figs. 7*).—An account of studies at the Institute for Applied Botany. Detskoe Selo, Union of Socialistic Soviet Republics, in which constant breeding F_2 hybrids were secured between cabbage and the radish and between various other cruciferous plants.

A preliminary report on the chromosome complement of "rabbit-eared rogues" in culinary peas (Pisum sativum L.), I. Bunten (*Amer. Jour. Bot., 17* (*1930*), *No. 2, pp. 139–142, figs. 4*).—Counts made at the Wisconsin Experiment Station upon sections of the hypocotyl of rogue and normal Gradus pea plants harvested in the seedling stage showed 14 diploid chromosomes in both types, suggesting that rogues are not due to aberrancy in the number of chromosomes.

Studies of heredity in plants, F. Oehlkers (*Erblichkeitsforschung an Pflanzen. Dresden: Theodor Steinkopff, 1927, pp. VIII+203, figs. 10*).—This is an outline of the development of heredity studies in plants during 15 years.

Genetical and cytological studies of semisterility and related phenomena in maize, C. R. Burnham (*Natl. Acad. Sci. Proc., 16 (1930), No. 4, pp. 269–277, figs. 2*).—A preliminary report is made of studies at Cornell University and Bussey Institution on two new partially sterile lines of corn derived from a pedigreed strain grown at the University of Wisconsin in 1927. The parent line was unrelated to the stock in which semisterile-1, reported by Brink (E. S. R., 57, p. 823), arose.

In semisterile-1 and in the two new types, semisteriles-2 and -3, an association of nonhomologous chromosomes took place at meiosis. A group of four chromosomes occurred plus eight bivalents. The combination of semisteriles-1 and -2 gave a new class which was somewhat more than 75 per cent sterile and in which two separate groups of four chromosomes occurred plus six bivalents. Neither of the two pairs involved in semisterile-2 was concerned in semisterile-1. The *sh wx* pair was one of those involved in semisterile-2. The combination of semisteriles-1 and -3 gave a new class which was a little less than 75 per cent sterile and in which there was a group of six chromosomes plus seven bivalents. It appeared that one of the pairs involved in semisterile-3 is probably the same as is concerned in semisterile-1, and, therefore, must be either *P br* or *B lg*. Exceptional 21-chromosome plants showing intermediate degrees of sterility arose from partially sterile 20-chromosome plants. The extra chromosome seemed to belong to the group involved in semisterility.

The inheritance, interactions, and linkage relations of genes causing yellow seedlings in maize, M. T. Jenkins and M. A. Bell (*Genetics, 15 (1930), No. 3, pp. 253–282, fig. 1*).—The two new lethal factors for yellow seedlings in corn, l_3 and l_4, described as simple recessive from studies at the Iowa Experiment Station in cooperation with the U. S. Department of Agriculture, were found to be similar to l_2 described by Lindstrom (E. S. R., 55, p. 329) in their interactions with other chlorophyll factors. The gene l_3 showed no indication of linkage with certain members of the $R–G$, $B–L_g$, $Y–P_l$, *and* $Ra–G_{l1}$ linkage groups. Gene l_4 showed linkage with three members of the $R–G$ linkage group. Its most probable location appeared to be 36 units to the left of *R*. The order of the four genes of this linkage group included in this study apparently was $L_4–R–W_2–L_2$.

Studies in inheritance in cotton, M. Afzal (*India Dept. Agr. Mem., Bot. Ser., 17 (1930), No. 4, pp. [1]+75–115, figs. 14*).—The inheritance of nine characters was studied at the Imperial College of Tropical Agriculture at Trinidad in a cross between *Gossypium cernuum* with narrow broad-lobed leaves, long bracts, petals, and bolls, very short lint, and very high lint index and seed weight, and Burma silky (*G. indicum*) with shallow, broad-lobed leaves, short bracts, petals, and bolls, long lint, and low lint index and seed weight.

Heterosis did not show in the F_1 except in length of petiole. With leaf factor, leaf lobe, index of lowest sinus breadth, length of bracts, petals, and of bolls, and of seed index, the F_1 was intermediate, while the Burma silky parent tended to dominate in width of bolls and lint length and the *G. cernuum* parent in lint index. The depth of laciniation was simple in inheritance. The length and breadth of bracts showed very little splitting in the F_2, while the other characters were very complicated. Correlations determined showed that the lint length was inherited independently of lint index and seed index, and that lint index was correlated very highly with seed index, indicating that it might be possible to combine these three characters.

Cytological investigations with Fragaria [trans. title], C. F. Rudloff (*Gartenbauwissenschaft, 3 (1930), No. 2, pp. 79–100, figs. 9*).—In studies conducted at the Kaiser Wilhelm Institute for Genetic Investigations it was found that one or more embryo sac mother cells may develop from the usually five-celled archespore. In some cases it was observed that two complete embryo sacs may fuse, and fusion of the nuclei was not prevented, especially if they lay exactly beside or over one another. In *F. virginiana* and also in *F. vesca?* two complete embryo sacs were often observed side by side. In *F. virginiana* the embroys were in many instances crowded in various stages by the nucellus. This situation was also noted in *F. vesca?*, in which species complete embryo sacs were now and then eliminated.

In Fragaria there was noted a strong tendency for transmutation from the hermaphroditic to the dioecious condition. In extreme cases of degeneration in the female series there resulted dwarf plants. In some hybrids functionless stamens were observed as transitional stages between true staminodia and stamens. In *F. virginiana* an average of 22.5 per cent of the pollen was nonviable. Chromosome counts on *F. vesca?* showed 7 and in *F. virginiana* 28. A hybrid between *F. grandiflora* and *F. vesca?* had 14 bivalent and 7 univalent chromosomes.

The inheritance of natural immunity among animals, A. W. Kozelka (*Jour. Heredity, 20* (*1929*), *No. 11, pp. 519–530*).—A review of investigations bearing on this subject.

A zebra-horse cross, E. Roberts (*Jour. Heredity, 20* (*1929*), *No. 12, pp. 544–548, figs. 4*).—Success in crossing a Grevy zebra with mares is reported. A number of zebroids were produced which were gentle, good workers, and stood hot weather better than other animals. Both males and females were sterile.

Atavism in Jersey cattle, J. L. Lush (*Jour. Heredity, 20* (*1929*), *No. 8, pp. 381–383, figs. 2.*)—In a contribution from the Texas Experiment Station, an account is given of a very dark-colored grade Jersey cow which produced a daughter of a very light color. The light-colored daughter in turn produced a very dark-colored daughter closely resembling her granddam in many respects.

Twins in Jersey cattle, J. L. Lush (*Jour. Heredity, 20* (*1929*), *No. 11, pp. 510–513, fig. 1*).—A set of Jersey cattle twins is described as having a noticeable difference only in the width of the ring of black hair around the tail, a slight variation in the curvature of the horns, and a slight difference in the set of the right rear teat. They were remarkably similar in all other respects, including milk yield.

[Sheep breeding investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 250* (*1930*), *pp. 20, 21*).—Studies of inbreeding in sheep, by E. G. Ritzman, over a period of 15 years during which no outside blood was introduced for 7 generations, resulted in a decrease in size, even with constant elimination of the small-sized individuals. There was, however, no reduction in fertility, and the percentage of twins increased. Further studies indicated that higher milk-yielding capacity was associated with the multinipple characteristic, but few individuals have been produced with more than two functional nipples.

Other studies of the effect of crossing coarse wool and fine wool breeds indicated that the crossbreeds are intermediate.

Heredity of the trail barking propensity in dogs, L. F. Whitney (*Jour. Heredity, 20* (*1929*), *No. 12, pp. 561, 562, fig. 1*).—Numerous matings between dogs which bay on the trail and mute trailers have all produced open trailers. The type of voice is, however, like that of the still trailer. These two conditions segregate independently.

What do we know of the inheritance of useful characteristics in the domestic fowl, P. Hertwig (*Züchter, 2* (*1930*), *No. 2, pp. 44–50*).—A review of the knowledge of the mode of inheritance of such characteristics as egg production, broodiness, early maturity, winter pause, winter production, egg weight and fertility, and size of fowls.

Bantam genetics, C. H. Danforth (*Jour. Heredity, 20 (1929), No. 12, pp. 572–582, figs. 4*).—A study of the characteristics of Bantams which descended from a cross of Golden Sebright hens with a nonbearded Mille Fleur cock served as a basis for identification of various genetic factors.

The color and markings of the F_1 birds were much like the Sebright Bantams, having feathers which were a deep yellow with a black border wider than normal and with some black in the gold field. The tail and wing feathers were mossy and the hackle was somewhat laced, indicating that dominance is not the same over the entire body. The feathers appearing in subsequent generations were classified into six female types, ranging from pure black through mixtures of black, brown, and yellow to yellow feathers with no black except in the hackle primaries and tail. White spangling occurred with all feather types.

The data indicated that black and yellow are not to be considered as allelomorphic but are the result of the interaction of pattern factors. Three kinds of black were differentiated, one of which, the solid black, was due to a gene similar to the one designated as E^m by Dunn (E. S. R., 50, p. 227). It is further suggested that both breeds probably carry factors for the production of black and yellow in any position that supplementary genes permit. Five types of cock feathering were also differentiated.

A study of hen feathering in males indicated the operation of two main factors, one presumably determining the type of endocrine output and the other determining the threshold of response to endocrine stimulation. Modifying factors influence the precise grade of cock feathering to appear.

Leg feathering seemed to be satisfactorily explained by a two-factor hypothesis, the action of the factors being blending and cumulative. Mille Fleur was homozygous dominant and Sebright homozygous for both recessives. Vulture hock appeared to be due to a single factor which was incompletely dominant but was dependent for its expression upon the factor for leg feathering. The character of the comb, brachydactyly, and size was inherited in the Bantams in general accord with the inheritance of these characteristics in the larger breeds.

The inheritance of black and white in Rose Comb Bantams, M. A. Jull and J. P. Quinn (*Jour. Heredity, 20 (1929), No. 8, pp. 359–363, figs. 2*).—In the cross of Rose-Comb White and Rose-Comb Black Bantams it was found that white behaved as a simple Mendelian recessive. The F_1 birds from the white male mated with black females produced all black progeny, but in the reciprocal cross the hackles of the male progeny were laced with red. There were 427 F_2 progeny, of which 320 were black and 107 white.

A brown-and-black rabbit, J. N. Pickard (*Jour. Heredity, 20 (1929), No. 10, pp. 483, 484, fig. 1*).—A rabbit presumably heterozygous for black and short hair exhibited patches of brown in an otherwise black coat and patches of Angora hair in an otherwise short coat. The condition is assumed to be due to the abnormal distribution of whole chromosomes.

Hereditary absence of clavicles, A. Kelley (*Jour. Heredity, 20 (1929), No. 8, pp. 352–355, figs. 2*).—A man is described who had a complete absence of clavicles. The condition was evidently hereditary. His mother was without clavicles, one brother was normal, and the only daughter of the subject was without clavicles.

Intelligence and size of family, N. A. Dayton (*Jour. Heredity, 20 (1929), No. 8, pp. 365–374, figs. 7*).—In continuing the study of the families of 10,455 retarded children in the Massachusetts public schools (E. S. R., 62, p. 625), the sizes of the families of native-born and foreign-born mothers having retarded and mentally defective children were tabulated. There were 6.52±0.21 children in the families of native-born mothers of retardates, 6.84±0.23 children in the families of native-born mothers of mental defectives, 7.54±0.11 children in the families of foreign-born mothers of retardates, and 7.64±0.09 children in the families of foreign-born mothers of mental defectives.

Twin and triplet birth ratios, R. L. Jenkins (*Jour. Heredity, 20 (1929), No. 10, pp. 485–494, figs. 6*).—In continuing the study of the interrelations of the frequencies of multiple births (E. S. R., 58, p. 731), the author has suggested the following formulas for predicting the number of triplet (T) and quadruplet (Q) births in a population:

$$T=\Sigma(a+b)\ [(a-c)+(a+c)]\ n$$

$$Q=\Sigma(a+b)\ [(a-c)+(b-c)]\ [(a-1\tfrac{1}{2}c)+(b+1\tfrac{1}{2}c)]\ n$$

In these formulas a and b represent the frequencies of monozygotic and dizygotic twins, respectively, c represents the diminution of tendency to a second doubling of the ovum, and n is the number of births by mothers of any age. When c is given a value of about $0.30a$, the percentages of each type of triplets and the sex grouping for triplets and quadruplets agree reasonably well with the observed data.

Some observations on the thymus gland in the fowl, A. W. Greenwood (*Roy. Soc. Edinb. Proc., 50 (1929–30), No. 1, pp. 26–37*).—Studies of the relation of the involution of the thymus to the presence of the gonads in fowls are reported. The studies involved determination of the thymus and gonad weights in normal males and females, and thymus weight in fully and partially castrated birds of both sexes, as well as in some with grafted gonad tissue. The results showed that males possessed more thymus tissue at maturity than female.

Grafting experiments also indicated that ovarian tissue induced more rapid involution of the thymus. A small amount of ovarian tissue appeared to exert the same influence as a larger amount.

An experimental analysis of the plumage of the Brown Leghorn fowl, A. W. Greenwood and J. S. S. Blyth (*Roy. Soc. Edinb. Proc., 49 (1928–29), No. 4, pp. 313–355, pls. 4, figs. 3*).—The results of studies of the dependence of the Brown Leghorn pattern and plumage on the thyroid and gonad activity are reported. Hypothyroidism brings about a diminution in the amount of melanin with an increase in the red pigment, and an increase in the fringing due to a lack of barbule formation. Hyperthyroidism has an opposite effect in males, but in females hyperthyroidism has only very slight influence.

From these results and the relation of the gonads to plumage, the hypothesis is suggested "that whereas the plumage typical of the male is developed independently of the gonad and depends for its maintenance on a certain level of thyroid functioning, both gonad and thyroid play a part in regard to that of the female; the former stimulates the latter to a higher level of activity than that present in the male and so indirectly causes a hyperthyroid effect on the feathers. At the same time it modifies this condition by acting directly on the feathers and restricting the deposition of melanin."

It is suggested that in the young chick the yolk may have an influence on plumage similar to that of the ovary, thus accounting for the female pattern of young chicks.

A comb-inhibiting gene, S. G. PETROFF (*Jour. Heredity, 20 (1929), No. 11, pp. 540–542*).—Data are cited from breeding experiments with fowls at the Central Genetical Station, Moscow, which show a deficiency in the numbers of pea comb fowls expected in back-crosses between birds heterozygous for pea comb and double recessives. It was further found that one nonpea-combed hen when mated with a nonpea-combed cock produced 10 nonpea-combed and 3 pea-combed offspring. This is taken to indicate the action of a factor inhibiting the expression of pea comb.

Experimental study of ovariectomy and transplantation in the pregnant albino rat, H. O. HATERIUS and W. O. NELSON (*Soc. Expt. Biol. and Med. Proc., 26 (1929), No. 8, pp. 659, 660*).—In studying the rôle of the secretion of the corpus luteum as a factor in the continuance of normal gestation in the rat, ovaries from virgin females were implanted in pregnant females on the ninth to the thirteenth day of gestation, and the host's ovaries were extirpated on the thirteenth or fourteenth day of gestation. When four or five days were allowed between implantation and extirpation of the host's ovaries, normal young were born. Histological study of the ovarian grafts invariably showed the presence of lutein tissue. When less time was allowed between transplantation and ovariotomy, pregnancy continued to term, but the young were stillborn or died shortly after birth. It thus appears that the corpus luteum is essential for the maintenance of pregnancy, and that immature ovaries transplanted into pregnant females may undergo adaptation and develop masses of luteal tissue to serve as functional substitutes for the original ovaries in pregnancy provided sufficient time is allowed for vascularization of the grafts.

Differential reaction of ovariectomized pregnant rats to ovarian grafts in various stages of the oestrous cycle, W. O. NELSON and H. O. HATERIUS (*Soc. Expt. Biol. and Med. Proc., 26 (1929), No. 8, pp. 660, 661*).—In connection with the above study, it was found that the stage of the oestrous cycle of the donor of an ovary for grafting studies influenced to some extent the duration of pregnancy in the host. Abortion occurred more quickly when an ovary was in the pro-oestrous stage. This suggests a probable rôle of the follicular hormone in parturition.

Effect of injections of urine from pregnant women on ovary of the rabbit, M. H. FRIEDMAN (*Soc. Expt. Biol. and Med. Proc., 26 (1929), No. 8, pp. 720, 721*).—It was found impossible to provoke ovulation in the rabbit by the transplantation of as many as 15 fresh rat hypophyses, but intraperitoneal injection of 12 cc. of urine from a pregnant woman twice daily for four days resulted in the appearance of fresh corpora lutea in the ovaries of each of 7 rabbits, though 9 rabbits similarly treated with urine from nonpregnant women did not produce corpora lutea. Histological study showed that the corpora lutea produced in this manner resulted from lutein transformation of corpora hemorrhagica, and that the corpora lutea retained the ova.

Preliminary quantitative studies on action of follicular hormone in spayed monkeys, J. A. MORRELL, H. H. POWERS, and J. R. VARLEY (*Soc. Expt. Biol. and Med. Proc., 26 (1929), No. 8, pp. 685, 686*).—Studies of the oestrous cycle in female monkeys injected subcutaneously with follicular hormone showed that doses of 30 rat units induced menstruation in about 50 per cent of the females tested, while no failures occurred where over 84 units were injected.

The male hormone: Its standardization, J. L. MCCARTNEY (*Soc. Expt. Biol. and Med. Proc., 26 (1929), No. 8, pp. 686, 687*).—Attention is called to the use of the clasping reflex in frogs as a measure for standardizing extracts of the male hormone.

Sexuality in lower plants, H. KNIEP (*Die Sexualität der Niederen Pflanzen. Jena: G. Fischer, 1928, pp. VI+544, figs. 221*).—This book deals with the determination, differentiation, and inheritance of sex among the thallophytes (algae, myxomycetes, and fungi) with conclusions in detail.

The application of Goldschmidt's hypothesis to the differentiation of sex in vertebrates, F. W. R. BRAMBELL (*Sci. Prog. [London], 24 (1930), No. 96, pp. 643–664, figs. 5*).—Although the X chromosomes are normally the decisive factors in determining sex, Goldschmidt found in studies with Lymantria that additional modifying factors were operating. These additional sex factors differed quantitatively in different strains, resulting in the production of all males in certain crosses. In Lymantria the factor F for femaleness appears to be located either in the W chromosome or in the cytoplasm of the egg. The factor M for maleness is located in the Z chromosome. Differences in the relative values of M and F in different species result in the production of intersexes and abnormal sex ratios in crosses between different strains. Attention is called to the occurrence of intersexes in various vertebrates which seem to support the operation of factors supplementary to the sex chromosomes in the determination of sex.

Variations of the rest metabolism of the rat in relation to the sex cycle, A. C. FRASER and B. P. WIESNER (*Roy. Soc. Edinb. Proc., 50 (1929–30), No. 1, pp. 1–7, figs. 7*).—Studies of the carbon dioxide output of female rats showed a distinct increase in metabolism on the day following cornification of the vaginal smear. Ovariotomy reduced the metabolic level, as well as the rhythmic variation. During psuedopregnancy there was considerable fluctuation in the carbon dioxide output, but rhythmic tendencies were not apparent.

FIELD CROPS

[Agronomic experiments in Hawaii], J. C. RIPPERTON, C. RICHTER, H. L. CHUNG, and R. K. LUM (*Hawaii Sta. Rpt. 1929, pp. 23–25, 28–31*).—Further investigations with field crops (E. S. R., 61, p. 723) reviewed briefly embraced variety tests with edible canna, cassava, taro, ginger, sweetpotatoes, corn, forage grasses, and green manure crops; breeding work with edible canna and corn; and trials of kudzu, ginger, and oriental vegetables.

In plantings on Oahu to determine the value of edible canna as a green manure in rotation with pineapples, at Waipio, where the soil was heavily infested with nematodes, the canna roots were appreciably affected, whereas at Pupukea on another heavily infested area canna showed practically no infestation. It was concluded that edible canna should not be planted just after a heavily infested pineapple ratoon had been plowed under, and that on soils not badly infested the canna can be used safely. Very porous soils did not seem desirable for canna culture. The adaptation of several districts to edible canna culture is indicated from surveys on Hawaii, Maui, and Oahu.

With Japanese taro the top surpassed the corm as planting material, as shown by yields. A study of the proportions of top, corm, and fibrous roots of a taro plant as it was harvested showed as the average of all the dry-land varieties studied top 31.7 per cent, corm 54.7, and fibrous roots 14.8 per cent, and for the wet-land varieties 52.2, 34.1, and 13.6 per cent, respectively.

Napier grass and Merker grass receiving sodium nitrate at the rate of 450 lbs. per acre gave best results in fertilizer tests. Mexican grass (*Ixophorus unisetus*) responded to complete fertilizer with heavy forage yields. Propagating material of Napier grass piled in a heap and exposed to weather made 100 per cent growth 29 days after cutting, but afterward deterioration was rapid. Napier cane cuttings piled in a shed showed a 60 per cent growth 65 days after cutting, although no growth was obtained from a lot similarly protected from the sun 74 days after cutting.

[Experiments with field crops in Washington], E. G. Schafer, O. E. Barbee, J. R. Neller, C. L. Vincent, H. M. Wanser, H. P. Singleton, and H. J. Jensen (*Washington Col. Sta. Bul. 237 (1929), pp. 13, 14, 16, 23, 33, 34, 45, 46, 48–50, 51, 52*).—Agronomic investigations (E. S. R., 60, p. 814) continued at the station and substations included variety tests with winter and spring wheat and barley, oats, rye, corn, potatoes, sweetpotatoes, alfalfa, and miscellaneous cover crops; cultural, including seeding tests, with wheat and potatoes; fertilizer tests with corn and potatoes; breeding work with wheat, oats, and potatoes; crop rotations; weed control studies; and pasture tests.

The wheat and oats produced much better after fallow than on corn ground. Small grains following legumes grew vigorously in the spring of 1929, but, in contrast with former years, made lower yields than after corn and small grain, apparently because of the little moisture available due to low rainfall. No advantage in yield resulted at the Adams Substation from the use of a deep furrow drill when stands were obtained with other drills.

Several potato varieties, Early Norther, McKinley, McCormick, Keeper, and Early Jersey Red Skin proved rather resistant to virus diseases at the station, and many of their offspring showed some resistance. Seedlings showing the most resistance had McCormick for the male parent. Cultural experiments with potatoes emphasized the need of ample soil moisture, high fertility, close spacing of hills, and a maximum of three plants per hill for high production of tubers of quality.

In pasture investigations at the Irrigation Substation, biennial white sweetclover required less water than did other pasture plants and also had the highest carrying capacity. Ladino clover, promising under irrigation, required more water but ranked fairly close to sweetclover in carrying capacity if properly managed. A mixed grass pasture required the most water of any of the plats, and its carrying capacity was the lowest. Under certain conditions in the Yakima Valley good results were had with mixed grasses, but it appeared that in general farmers are not justified in growing them on the well-drained sandy loam soils of irrigated Washington.

Chlorates were found the most effective of chemicals tested for weed control. Sodium chlorate was very efficient, but can be used safely only when specified methods and equipment are employed. A mixture of sodium chlorate with either magnesium chloride or calcium chloride gave very good results, with a reduced fire hazard. The catalase activity of the roots of treated plants appears to be a good index of the effectiveness of chlorates.

[Agronomic work in Northumberland County, England], C. Heigham (*Northumb. Co. Ed. Com. Bul. 42 (1929), pp. 4–6, 9–55, pl. 1*).—Field crops experiments at the county experiment station at Cockle Park continued and resembled those recorded in earlier reports (E. S. R., 59, p. 826).

[Report of the] Scottish Society for Research in Plant-Breeding, W. Robb (*Scot. Soc. Research Plant Breeding Rpt., 1929, pp. 1–22, figs. 4*).—Breeding work with oats, potatoes, perennial ryegrass, timothy, sea plantain (*Plantago maritima*), swedes, and turnips is reported on briefly.

The point binomial formula for evaluating agronomic experiments, S. C. Salmon (*Jour. Amer. Soc. Agron., 22 (1930), No. 1, pp. 77–81*).—Several agronomic applications of the point binomial formula for calculating a standard deviation are furnished in this contribution from the Kansas Experiment Station. A simple method of securing probable error is indicated.

Legume inoculation, W. A. Albrecht (*Missouri Sta. Bul. 282 (1930), pp. 12, figs. 7*).—Inquiries are answered in regard to the value of legumes and their need for inoculation, the functions, conditions, and methods of inoculation, and the distribution of cultures.

Experiments with turf grasses in New Jersey, H. B. Sprague and E. E. Evaul (*New Jersey Stas. Bul. 497 (1930), pp. 55, figs. 17*).—Four phases of the turf problems in New Jersey are reported on.

I. *General conditions in the State* (pp. 3–15).—Grass covered areas of particular significance in New Jersey include lawns, parks, grounds of schools and other public buildings, golf courses, sports fields, and aviation fields. The northeastern and central portions of the State have the greatest need for turfed areas. Temperatures are more favorable for turf maintenance in northern than in southern New Jersey, but June, July, and August are the critical months for growth of turf grasses throughout the State. Since evaporation usually exceeds total rainfall from about May 15 to August 15 and the distribution of rains is uneven, artificial watering is required often during this period for continued growth of closely cut grass. The general suitability of the soils for growing turf grasses is given for five principal zones into which the State is divided on the basis of topography and soil.

II. *The adaptation of grasses* (pp. 15–24).—In studies since 1923 on the suitability of various species of grass for turf, the grasses suitable for putting greens and other fine turf were found to include Rhode Island bent, velvet bent, and creeping bent, including seaside bent and mixtures of these grasses. Rough-stalked meadow grass and red fescue are of limited value for putting greens in New Jersey. The bentgrasses listed above, redtop, Kentucky bluegrass, rough-stalked meadow grass, red fescue, fine-leafed fescue, meadow fescue, and perennial ryegrass were found to be adapted for use on lawns and fairways. The adaptations of each grass are indicated. Canada bluegrass, wood meadow grass, Italian ryegrass, and meadow foxtail proved of doubtful value on lawns and fairways. Timothy, orchard grass, tall oatgrass, and sweet vernal grass were found suitable only for coarse turf, such as the rough on golf courses. Desirable seeding mixtures of grasses are given for lawns and putting greens.

Late summer and early fall proved to be the most favorable time for seeding new lawns and renovating poor ones. Spring seedings must be very early to avoid, as much as possible, competition with annual weeds and injury from hot, dry weather. Cutting experiments showed that the putting greens on golf courses may be cut as close as $\frac{3}{16}$ in. daily, whereas lawns and fairways need not be mowed more than once or twice a week at a height of ¾ to 1 in. The different species of grass were found to vary greatly in their tolerance to close cutting.

III. *Fertilizer experiments on turf for putting greens* (pp. 24–37).—Among the nitrogenous fertilizers applied to creeping bent turf, ammonium sulfate, ammo-phos, and urea proved capable of making the soil more acid. Sulfur also was effective in accomplishing this result but burned the turf unless applied carefully. Liming was the most effective method of correcting acidity. Sodium nitrate and certain organic fertilizers, as bone meal, cottonseed meal, and alfalfa meal tended to reduce acidity if used continuously, whereas farmyard manure did not influence acidity. Manure as a fertilizer intensified the weed problem because of its weed seed content. Weeds were reduced on soils made strongly acid but not more than on soils heavily limed and fertilized with nitrogen. Weed control by making the soil strongly acid seemed unwise because certain weeds tolerate acid conditions as well as the grass, and excessive acidity prevents healthy growth of turf throughout the season. Application of inorganic nitrogen fertilizers reduced weed growth, irrespective of their effect on soil reaction.

White clover was checked by close cutting, together with the use of soluble nitrogenous fertilizers, under which conditions liming did not increase clover. Growth of annual bluegrass (*Poa annua*) in creeping bent turf was favored by complete fertilizers but not by strongly acid soils. Soils made strongly acid could not maintain vigorous growth of bentgrass as well as soils mildly acid or neutral in reaction, differences which were most noticeable in fall and spring.

Earthworms were most abundant and active where organic materials had been used for fertilizers. Soils made strongly acid seemed much less suitable for earthworms than mildly acid ones. Castor pomace as fertilizer did not inhibit activity of the worms. Addition of 15 lbs. of lead arsenate per 1,000 sq. ft. in top-dressing eliminated all earthworms on a silt loam soil and greatly reduced the abundance of weeds and annual bluegrass without injuring the bentgrass, regardless of the fertilizer treatment.

IV. *Turf disorders on New Jersey golf courses in 1928* (pp. 37–51.)—In a new type of injury to turf on putting greens which occurred in 1928 annual bluegrass was often killed overnight, the dead turf having a characteristic reddish color, while bentgrasses in the same areas were not harmed. The degree of injury to turf was correlated with the abundance of annual bluegrass. The abundance of annual bluegrass on injured greens appeared due principally to the heavy subsoils and poor subsurface drainage which favored its growth at the expense of the bentgrasses originally present. These high percentages of annual bluegrass made possible serious injury to turf from specific fungi when weather conditions favored their development. Fungi found closely associated with the diseased condition of annual bluegrass were *Colletotrichum cereale, Helminthosporium vagans*, and *Fusarium* sp. Inoculation studies indicated that these organisms each can produce the diseased condition observed on annual bluegrass in 1928. It seems likely that all three organisms were active, *C. cereale* probably being of greatest importance. Closely clipped plants could not withstand the attacks of the organisms so well as those allowed to grow taller. Prevention of the disease should include avoidance of management practices which allow predominance of annual bluegrass, removal of all clippings during warm humid weather, and the adoption of management practices which permit rather slow but tough, hardy growth. Control measures were not perfected for this disease, although a large number of chemicals were tested, many of which were ineffective.

A study of the root systems of some important sod-forming grasses, A. S. Laird (*Florida Sta. Bul. 211 (1930), pp. 28, figs 6.*)—Root systems of centipede, Bahia, Dallis, blue couch, Bermuda, St. Lucie, and St. Augustine grasses were studied under pasture, lawn, and putting green conditions.

When several of the grasses were grown in competition on Fellowship sandy loam soil under pasture conditions, centipede grass produced the best top growth and second best root growth, and Bahia grass had the best root system. Centipede and Bahia grasses similarly excelled on Norfolk sand under lawn conditions. The other grasses, except Bermuda, produced good root growth, and the root systems of all the grasses extended to depths of from 6 to 8 ft. Centipede grass seemed to be the most outstanding of these grasses for both pasture and lawn purposes.

Bermuda and centipede grasses mowed enough to prevent seed formation produced better developed root systems than when not mowed. However, this tendency was not so pronounced with St. Augustine grass. A 3-in. top-dressing of clay on Norfolk sand resulted in better root systems with Bermuda, St. Lucie, and centipede grasses than did the Norfolk sand alone without ammonium phosphate. When ammonium phosphate was applied the growth of the roots on both soils was about the same. A clay top-dressing and an application of ammonium phosphate increased decidedly the concentration of the root systems of all the grasses in the 8 in. of surface soil.

Spikelets of Johnson grass and Sudan grass, B. Long (*Bot. Gaz., 89 (1930), No. 2, pp. 154–168, figs. 26*).—This contribution from the University of Indiana indicates the morphological difference in the spikelets of the two grasses and describes the spikelets from serial sections.

The effect of nitrate of soda on the yield and chemical composition of a simple seeds mixture in the first harvest year under different systems of management, T. W. Fagan, W. E. J. Milton, and A. L. Provan (*Welsh Plant Breeding Sta., Aberystwyth,* [*Bul.*], *Ser. H, No. 9 (1926–1927), pp. 27*).—Sodium nitrate supplied in five 0.75-cwt. dressings to pasture sown to a mixture of Italian ryegrass 16 lbs., perennial ryegrass 2 lbs., and Montgomery late-flowering red clover 4 lbs., increased the yield of grass whether cut weekly or monthly and similarly affected the hay and two aftermaths. It increased the protein and lowered the fiber content of the weekly and monthly cut grass, hay, and first aftermath, although its influence on these constituents of the second aftermath was negligible. The applications depressed the phosphorus and calcium contents of the weekly and monthly cuts, as well as the phosphorus in the hay. The response to the fertilizer was greater in grasses than clover. The nitrate had a greater influence on the ratio of stem to leaf in the monthly than in the weekly cuts. The yield of dry matter from like areas was much larger under a monthly system of cutting than a weekly, although the composition of the weekly cut was the superior. The changes in chemical composition of the stem and leaf with age showed a fall in protein and phosphorus accompanied by an increase in fiber. The calcium content of the leaf fell steadily with maturity, while in the stem there was a gradual increase. Applications of these observations to practice are provided.

✓ **Corn, an important crop plant** [trans. title], H. Busz (*Arb. Deut. Landw. Gesell., No. 372 (1929), pp. 80, figs. 26*).—The producing regions, practices in growing corn for grain and silage, and corn breeding in Hungary and Rumania are described from extensive surveys in 1927 for application under conditions in Germany.

Cotton varieties for Louisiana: Preliminary report, H. B. Brown (*Louisiana Stas. Bul. 207 (1930), pp. 35, figs. 3*).—Varietal trials since 1926 in different localities in the State showed that Wilson-Cleveland, D. & P. L. No. 4–8 and No. 6, Dixie-Triumph, Stoneville No. 2, Delfos, and Express 317 were generally the most profitable cottons. Variety adaptations to particular regions are indicated. Information is also given on cotton production in the State, varietal acreage, home-grown seed, and control of boll weevils and fungus diseases of cotton.

Reports [on cotton investigations] received from experiment stations 1928–1929 (*London: Empire Cotton Growing Corp., 1930, pp. XI+268, pls. 3, figs. 44*).—The cotton research reported on was conducted in the same regions and was similar in scope to that noted previously (E. S. R., 62, p. 519).

The influence of various top-cutting treatments on rootstocks of Johnson grass (Sorghum halepense), D. G. Sturkie (*Jour. Amer. Soc. Agron., 22 (1930), No. 1, pp. 82–93*).—Determinations at the Alabama Experiment Station on plants from about 3 in. high to those with mature seed showed that Johnson grass develops rootstocks usually after the heads appear, but that a few rootstocks will form late in the season even if heads do not come out.

Cutting in both the greenhouse and in the field at stages from 1 ft. to maturity demonstrated that any cutting treatment reduces the rootstock development and that the reduction increases with the cutting frequency. Although cutting only during the latter half of the season did not reduce the weight of rootstocks as much as did continuous cutting, the top growth the next year was reduced as much, indicating that late cutting had reduced the food reserve much more than the weight of rootstocks indicated and was as effective as continuous cutting. Discontinuing cutting in the middle of the season permitted the plant to develop 40 per cent more rootstocks than with continued cutting. The most top growth usually was produced when the plants were cut with the seed in the late milk stage. Cutting at this time did not reduce the yield of top growth in the second year as did cutting prior to this stage. Plants starting the season with a well-developed system of rootstocks yielded at least 50 per cent more tops than those not so equipped and also developed more new rootstocks during the season.

Korean lespedeza in Missouri, W. C. Etheridge, C. A. Helm, and B. M. King (*Missouri Sta. Bul. 280 (1930), pp. 14, figs. 8*).—Korean lespedeza has been found to be well adapted to the soils and seasons of Missouri, being of particular value for poor lands. It is less suitable for hay than for pasturage. Advice based on station tests is given for seeding and pasturing the crop and cutting for hay and seed.

Commercial possibilities of the common milkweed as indicated by its yield and composition, F. Gerhardt (*Indus. and Engin. Chem., 22 (1930), No. 2, pp. 160–163, figs. 3*).—Experiments at the Iowa Experiment Station with milkweed (*Asclepias syriaca*) (E. S. R., 62, p. 419) indicated an acre production of 30 bu. of seed, 280 lbs. of floss, and 1 ton of air-dry stems. The ratio in yield of pod to seed was about 12 to 1 and of seed to fiber 2 to 1. The seeds contain large quantities of nitrogen, oil, and phosphorus, 21 per cent of the seed being composed of a semidrying oil and 47 per cent of the remaining meal being crude protein.

Certain of the properties of the floss suggested a similarity to kapok. Where fiber brittleness is not the determining factor, milkweed floss may be used especially in life saving, insulating, and playground equipment. The bast fibers, which approximate 10 per cent of the weight of the stem, like flax may find application in the textile industry. The stem tissue contains 36.5 per cent alpha-cellulose and compares favorably with many softwoods in this respect, while its hydration capacity, fiber length, and strength are favorable to the production of a paper pulp of merit. The characteristics of the seed, floss, and fiber are compared with those from other common crops.

Columbia oats, a new variety for Missouri, L. J. Stadler and R. T. Kirkpatrick (*Missouri Sta. Bul. 278 (1930), pp. 12, figs. 5*).—Columbia oats, an off-type selected from Fulghum in 1920, is an early-maturing strain resembling Burt more than typical Fulghum. Compared with Burt the plants are taller and more uniform and the panicles are longer and distinctly more erect. It is stiff strawed, excelling both Burt and Fulghum. The grain of Columbia is medium large, better filled than in Burt although not so plump as in Fulghum, usually awnless, gray with conspicuous light veins, and the basal joint and basal hairs absent or inconspicuous. Under average Missouri growing conditions the weight per bushel and the percentage of kernel average as high in Columbia as in Fulghum. From comparative tests during several years, Columbia appears to be at least equal to Fulghum in yield under ordinary conditions and superior from late seeding. Columbia oats also are susceptible to the same strain of smut as Fulghum.

Growing potatoes in Illinois, J. J. Pieper, W. L. Burlison, and W. P. Flint (*Illinois Sta. Bul. 344 (1930), pp. 241–284, figs. 14*).—The general requirements of potatoes for good yields are described, and varieties, seed selection, fertilizer, cultural, harvesting, and storage practices are recommended for potato production in Illinois. Potato diseases and insects and methods for their control are described briefly.

Fertilizer trials at the station and elsewhere in the State indicated that lime should be applied only where the soil is too acid to grow a legume in the rotation with potatoes. The use of rock phosphate did not seem justified where heavy applications of barnyard manure are made which carry far more phosphorus than needed for the crops in the rotation. It is recommended that the phosphorus need of the soils be determined and the carrier used which promises largest net returns under the conditions. Barnyard manure has given the most consistent and the largest increases of any fertilizer used. On most soils in the State indications were that the use of organic manure will increase materially the yield of potatoes. Most of the soils of the State were found to contain enough potassium for crops other than potatoes, possible deficiencies being only in sandy, peaty, and clay soils low in active organic matter. Formulas and rates for commercial fertilizers are suggested for different soil types.

Varietal trials suggested Irish Cobbler and Early Ohio of the early potatoes and Carman No. 3 of the late group. Northern-grown seed proved decidedly superior to home-grown stock, especially in the Cobbler group.

Experiments to find the best sprays to combat potato insects and diseases showed conclusively that the addition of Bordeaux mixture, either as a spray or dust, to the arsenate of lead on the average increased the yields about one-third. In years when potato leafhoppers and potato blight were abundant the yields were increased as much as 100 per cent. Bordeaux mixture applications 7 days apart gave larger gains than 10 days apart. The average gain per acre for the use of Bordeaux mixture with arsenate of lead over arsenate of lead alone was in northern Illinois 61.7 bu., in central Illinois 19.7, and in southern Illinois 34.5 bu.

Effect of size of seed used in commercial planting on the incidence of leaf-roll and mosaic in potatoes, O. Butler (*Jour. Amer. Soc. Agron., 22 (1930), No. 1, pp. 75, 76*).—Comparative trials during four years by the New Hampshire Experiment Station of seconds (seed tubers 1½ to 1¾ in. in diameter) and standards (1¾ in. to 12 oz. in weight) showed that the percentage of mosaic and leaf roll developing in the plants grown from certified potato seed of good quality is not affected by the size of the seed stock purchased.

Sorghum crops on the high plains of Oklahoma, H. H. Finnell (*Oklahoma Sta. Bul. 191 (1929), pp. 30*).—Yields and other agronomic characters are described for 23 varieties of sorghum grown in comparison on silty clay loam at Goodwell, Okla., from 1924 to 1928, inclusive. Information on seed selection and cultural and harvest practices is also included.

Ranked as to grain yield over the 5 years the leading varieties were Improved Dwarf Yellow milo, Dwarf White milo, Yellow Straight Neck, Dwarf Yellow milo, Standard Yellow milo, Desert Bishop, and Spur feterita. In 3.5-ft. rows African millet, Sunrise kafir, Sumac sorgo, and Mexican Desert sorgo led in stover yields. There was a more or less definite tendency of the varieties to show adaptation for either wide, 7-ft., or narrow, 3.5-ft. spacing. The milos as a group gave nearly equal results in grain yield from the two spacings and so did Spur feterita, Desert Bishop, Dawn kafir, Clubhead sorgo, and several of the minor grain-producing varieties, whereas a very marked preference for wide spacing was shown by Yellow Straight Neck, Dwarf Blackhull kafir, and Reed kafir. More varieties appeared adapted to planting in June than in any other period. The variation between the varieties used was less during this planting period than any other, and the average yield for the entire group was highest.

Abortive seeds in soybeans, C. M. Woodworth (*Jour. Amer. Soc. Agron.*, *22* (*1930*), *No. 1*, *pp. 37–50*, *figs. 3*).—Observations made at the Illinois Experiment Station with several varieties of soybeans, largely with Illini (E. S. R., 62, p. 329), revealed a considerable amount of abortiveness, varying for the different sorts studied from 9.4 to 22.2 per cent. The four types of pods based upon seed number from one to four showed approximately the percentage of abortion expected on the basis of chance. Abortion of seeds was most frequent in the basal position, least in the tip, and intermediate in the middle position of the pod. Normal seeds from pods containing no abortive seeds were heavier than normal seeds from pods with one or more abortive seeds. The middle seed or seeds in 3- and 4-seeded pods with no abortive seeds showed the best development. Seed abortion was least at the center of the plant, greatest at the tip, and intermediate at the base.

Time of harvesting soybeans in relation to soil improvement and protein content of the hay, R. E. Uhland (*Missouri Sta. Bul. 279* (*1930*), *pp. 28*, *figs. 7*).—A detailed study was made during four years and on two soil types of the yield and composition of soybeans as influenced by different planting methods and the stage of maturity of the soybeans when harvested.

The development of the pods and extent to which they are filled was found to serve as the best index for maximum yields of hay. A maximum hay yield was obtained when the pods were well formed and about one-third to one-half filled, at which stage the largest weight and the maximum protein in the hay as leaves and minimum as woody stalks were harvested. The quantity of the hay which occurs as pods at this time is relatively small. The time of maximum harvest is also best for the most uniform distribution of protein through the hay and for the greatest protein yield. Deferring harvest beyond maximum yield appeared to mean less weight in leaves and leaves of lower protein content, more leaves dropped from the plant, a proportionately higher weight of stems of a lower protein content, and an increase in pod and seed development and a corresponding concentration therein of the plant protein from the leaves and stems. The age of the crop in days after planting, plant height, yellowing or dropping of the leaves, and time of blooming were not found safe criteria for the best time for harvest.

The maximum weight and protein yield were obtained earlier with the crop drilled solid rather than in rows and cultivated. The differences were greater in the catch and substitute crops than in the main crops. For soil improvement it was evident that soybeans harvested at the time of maximum yield should provide very beneficial effects if utilized properly. While delay in harvest adds more leaves to the soil, the increased soil improvement is not commensurate with the loss in the value of the hay. The data indicated that with proper management soybeans harvested for hay or for seed furnish considerable nitrogen to the soil. However, the actual gain of nitrogen by the soil is small, even on level land, unless the soil is pastured, used as green manure, or fed and the manure carefully returned. Erosion data showed that the nitrogen gains in growing soybeans may not be large enough to cover losses on rolling land, especially when the crop is planted in rows and cultivated.

Report on the sugar beet experiments, 1928 (*Dublin: Dept. Lands and Agr.*, *1929*, *pp. 33*; *also in* [*Irish Free State*] *Dept. Agr. Jour.*, *29* (*1929*), *No. 1*, *pp. 102–128*).—Experiments with sugar beets in various centers in the Irish Free State are reported on as heretofore (E. S. R., 60, p. 435).

During the years 1926, 1927, and 1928 the time of the year when manure was applied for sugar beets, i. e., during winter or in the drills just before planting, did not have any appreciable influence on the shape of the roots produced or on yield and sugar content. An application of 4 cwt. of superphosphate (35 per cent), 4 cwt. of kainite, and 1 cwt. of ammonium sulfate per statute acre, just before planting was satisfactory. No benefit came from applying the phosphorus and potassium carriers in winter instead of spring. The best results in both yield and sugar content were had with drills 21 in. or less in width and with plants singled to about 9 in. apart. The optimum time of singling was when the plants had developed four rough leaves.

Current studies showed a very slight increase in yield and sugar content to come from a dressing of sugar factory waste lime at the rate of 4 tons per statute acre applied to the land in the autumn or winter before beets were grown. In storage over 8 to 10 weeks in the ordinary straw-covered narrow clamp there was a decrease of sugar of about 6 per cent of the total sugar in the beet.

Studies on methods for control of pollination in sugar beets, E. E. Down and C. A. Lavis (*Jour. Amer. Soc. Agron., 22* (*1930*), *No. 1, pp. 1–9, figs. 4*).—Experiments were conducted at the Michigan Experiment Station in cooperation with the U. S. Department of Agriculture to control the pollination in the production of close-fertilized sugar beet (*Beta vulgaris*) seed. From the seed production of space isolated mother beets during five years it was evident that well sheltered city gardens are very suitable for producing close-fertilized sugar beet seed, although nearby seed plants of Swiss chard and red garden beets must be destroyed. However, crosses of this type which may occur are recognized readily in the F_1 and do not prevent further work with a pure material.

Experiments with cloth cages in which red garden mother beets were used alternately with sugar beets gave 31.6 gm. of seed per caged sugar beet. Since 41 per cent of the viable seed was identified as hybrid, and assuming like crossing between sugar beets as between garden beets and sugar beets, 82 per cent of the viable seed would be the result of cross-fertilization. The production of close-fertilized sugar beet seed within parchment paper bags was tried in 1927, but no seed was produced on bagged seed stalks. Apparently the lack of success could be attributed to the extremely high temperatures which prevailed during flowering.

Notes on the sugar industry of Java [trans. title], R. Fernández García and M. A. del Valle (*Porto Rico Dept. Agr. and Labor Sta. Bul. 35* (*1930*), *Spanish ed., pp. 131, pl. 1, figs. 94*).—This informative study of the sugar industry of Java embraces a brief résumé of political, industrial, agricultural, and commercial conditions in Java and an account of sugarcane culture by Fernández García treating of the soils, production practices, surgarcane varieties and varietal improvement, and diseases and insects attacking sugarcane. A discussion of machinery and manufacture by Del Valle deals with the milling of sugarcane, extraction of juice and sugar manufacture, social and economic phases of the industry, and methods of control and analyses. The organization and activities of the Sugar Experiment Station at Pasuruan are outlined, and the program and list of delegates to the Third Congress of Sugar Technologists held at Surabaya, Java, June 7 to June 19, 1929, inclusive, are also included.

Inter-annual correlation for protein content and weight per unit volume in wheat, A. E. Treloar and J. A. Harris (*Jour. Amer. Soc. Agron., 22* (*1930*), *No. 1, pp. 28–36, fig. 1*).—The correlation between the protein content, weight per unit volume, and quality index of wheats grown in a series of districts throughout a period of years was studied at the University of Minnesota. Statistical analysis of the data of the Rumanian wheats tabulated by Zaharia (E. S. R., 24, p. 38) for the period 1900 to 1908 shows average values of +0.3653 for weight per unit volume, +0.4652 for protein content, and +0.5447 for quality index. The inter-annual correlations for rainfall were low, averaging +0.1767 for May and +0.0869 for June. While these correlations represented interrelationships covering a range of nine crop years, the magnitudes of the correlations were not affected greatly by the period of separation of the two variables.

"With inter-annual coefficients of the magnitude of those determined herein, the prediction of future quality of wheat crops should be possible within a reasonable degree of accuracy."

Effect of severe weathering on the protein and ash contents of wheat and flour, W. O. Whitcomb and A. H. Johnson (*Cereal Chem., 7 (1930), No. 2, pp. 162–168*).—Further studies (E. S. R., 59, p. 331) at the Montana Experiment Station demonstrated that the protein and ash contents of Kanred and Marquis wheat subjected to severe weathering conditions were not changed even though marked changes were observed in the physical properties and in germination.

Hygroscopic moisture of flax seed and wheat and its relation to combine harvesting, A. C. Dillman (*Jour. Amer. Soc. Agron., 22 (1930), No. 1, pp. 51–74, figs. 11*).—Experiments by the U. S. D. A. Flax Investigations dealt with the rate of absorption of hygroscopic moisture by seeds of flax and wheat exposed to different relative humidities, the rate of drying of wet seeds and the effect of an air current thereon, and the rate of absorption of free water by wheat. The absorption and loss of moisture by standing grain is deemed of particular significance in relation to combine harvesting.

Dry flax seeds were found to absorb hygroscopic moisture somewhat more rapidly at first than wheat seeds, and both absorbed moisture much more rapidly than did alfalfa seed. Whole flax bolls absorbed moisture about twice as fast as the seeds, suggesting why dry flax becomes difficult to thresh after a short period of high humidity. The rate of absorption of hygroscopic moisture by dry seeds of flax, wheat, and corn varied with the temperature, at least within a certain range.

Wheat seeds containing 21 per cent of moisture and flax seeds containing 14 per cent, it was observed, will either absorb more moisture or lose moisture, depending upon the humidity of the air. Seeds of wheat with 38 per cent of moisture and flax with 25 per cent still absorbed moisture in a saturated atmosphere but lost moisture in an atmosphere of lower relative humidity. At 75 per cent relative humidity the rate of drying of wheat was comparatively slow below 18 per cent of moisture. The absorption of free water by wheat was extremely rapid as compared with the absorption of hygroscopic moisture.

Of practical importance was the observation that wet grain will not dry in an atmosphere of high relative humidity. A relative humidity well below 75 per cent appeared necessary for effective drying. Movement of the air, as by a breeze, increases the rate of drying, provided the relative humidity is suitable. Dry grain will absorb moisture in air of high relative humidity, the absorption rate depending upon the moisture content of the grain and the relative humidity. When the relative humidity is high, as at night and during humid days, it would seem desirable to close the ventilators of ventilated bins containing grain of moderate moisture content.

The goatgrass situation in California, M. W. Talbot and L. S. Smith (*Calif. Dept. Agr. Mo. Bul., 19 (1930), No. 1, pp. 40–46, figs. 2*).—The characteristics, history, and known distribution of goat grass (*Aegilops triuncialis*) are described with a résumé of experiments on eradication and recommendations for its control. Suggested measures include avoidance of spreading seed, chemical destruction of scattered patches, prevention of seeding by cutting and burning, and removal of livestock from infested areas before goat grass heads form.

Kainit kills mustard in oats (*New Hampshire Sta. Bul. 250 (1930), pp. 10, 11*).—O. Butler and R. Bissey observed that broadcasting finely ground kainite may control mustard, a serious weed in oats. Cyanamide was even more effective but tended to cause oats to lodge. Both materials must be applied when the fields are wet. Several liquid sprays were also found effective, 90 per cent of the mustard being destroyed when chemicals were used at the following strengths: Copper nitrate 1 per cent, sodium bichromate 1.8, sulfuric acid 2.2, copper sulfate in 10 per cent sodium nitrate 2.5, sodium bisulfate 3.8, copper sulfate 5, iron sulfate 15, ammonium sulfate 20, and sodium nitrate over 20 per cent. The rate at which the chemicals dried usually did not affect greatly their toxicity to mustard. An exception was iron sulfate, which was about twice as active when dried slowly. Copper sulfate and sodium nitrate mixed, sodium bisulfate, and sodium bichromate have given promise as very desirable herbicides.

Experiments on the control of mustard, R. Bissey and O. Butler (*Jour. Amer. Soc. Agron., 22 (1930), No. 2, pp. 124–135, figs. 4*).—The experiments noted above are reported in detail.

The official seed-testing station: Record of operations for 1928, N. R. Foy (*New Zeal. Jour. Agr., 38 (1929), No. 5, pp. 323–331*).—The average germination and purity are tabulated for 10,149 samples of agricultural seed tested at the New Zealand seed testing station at Wellington during 1928.

HORTICULTURE

History of the Massachusetts Horticultural Society, A. E. Benson ([*Boston*]: *Mass. Hort. Soc., 1929, pp. IX+553, pls. 24*).—A review of the development, accomplishments, administration, and expansion of the society since 1830.

[Horticulture at the Hawaii Station], W. T. Pope, J. C. Ripperton, C. Richter, H. L. Chung, R. K. Lum, and H. F. Willey (*Hawaii Sta. Rpt. 1929, pp. 3–22, 25, 31, 32, figs. 8*).—In a like manner to the preceding report (E. S. R., 61, p. 732), this presents detailed information on the culture, propagation, and pollination of various horticultural plants. A total of 68 species were introduced during the year, and approximately 28,000 plants of various species were distributed for testing. Brief notes are presented on all the fruits under trial and on the results of various seminal and vegetative propagation tests. Covering the graft union and the entire scion of young avocado grafts with paraffin favored successful growth. Studies of the pollination habits of the papaya showed that failure of pollination to occur during the year results in certain plants becoming more or less sterile. The papaya flowers cross freely and display marked evidence in the fruit of the first generation. A tendency to mutation in this species was noted.

A study of the native raspberry, akala, composed of two distinct species *Rubus hawaiiensis* and *R. macraei*, was made during the year. Fruits averaged

1 in. in diameter, were dark purple or yellow in color, and had considerable merit as food.

A chemical study of Macadamia nuts produced by seedlings and differing greatly in appearance, size, and thickness of shell showed but little variation between trees but wide variation depending on maturity.

Lettuce breeding in an attempt to secure a variety which would head satisfactorily was continued.

Comparing the average weights of pineapples produced on plats receiving various treatments, the largest fruits, 3.72 lbs., were produced on the sulfate of ammonia plat and the next, 3.71 lbs., on the lupine cover crop plat. The check plats produced fruits averaging 3.02 lbs.

[Horticultural investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 250 (1930), pp. 15, 16, 17–19, 26, 27, fig. 1*).—Summarizing the results of the second decade in the Woodman Baldwin orchard experiment (E. S. R., 61, p. 138), G. F. Potter reports that the plat that was cultivated, cover cropped, and given extra nitrogen in a complete fertilizer produced the largest average yields in this period, 337.6 lbs. per tree; 270 lbs. for the cultivated, cover cropped, and complete fertilizer plat; 240.3 lbs. for the cultivated, cover cropped, complete fertilizer with extra phosphorus; 232.7 lbs. for the cultivated, cover cropped, plus a complete fertilizer; 231.3 lbs. for the clean cultivated and cover cropped; 229.1 lbs. for the cultivated, cover cropped, complete fertilizer plus added potash; 216.9 lbs. for clean cultivation without cover crop; 150.6 and 92.3 lbs. each for two plats cultivated in alternate years and not cover cropped; and 74.6 lbs. for the sod plat. Observations showed that the increased production was due primarily to a greater production of fruiting wood and a correspondingly larger number of spurs. However, a larger proportion of spurs produced blossoms at 2 years of age in the highest producing plat.

Over a 7-year period cultivated apple trees produced 127.8 more pounds of fruit per tree on the average than did sod-grown trees receiving the same amount of nitrogen. Slight gains in set of blossoms and in yield but not in the percentage of spurs to bloom resulted from dividing the fertilizer application and applying in early spring and midsummer.

In time of differentiation studies with apples, E. J. Rasmussen found that the McIntosh initiated its flower buds in 1928 during a period of from 2 to 3 weeks, commencing about the third week of July. Baldwin formed its buds during the first 2 to 3 weeks of August.

In a long-time pruning experiment with McIntosh trees no significant differences in size or yield of fruit or in the amount of breakage were established between the vase, semi-leader, and full-leader trees. At 10 years the average trunk diameters of the three groups were, respectively, 5.27, 5.46, and 5.33 in., and the yields 190.4, 210.6, and 202.5 lbs. Some notes are given on variety tests of apples and peaches.

As determined by L. P. Latimer, Delicious proved to be a reliable pollinizer for McIntosh in 1929, being surpassed only by Red Astrachan and Williams. Other satisfactory pollinizers were Cortland, Oldenburg, and Wealthy. Low temperature interfered with the development of Wagener pollen. Size of McIntosh was not materially affected by the pollen parent, but there were significant differences in the number of seeds. Low set was accompanied by low seed production and off shape of fruit. An examination of all the fruits on two McIntosh trees showed 60 per cent on lateral and 40 per cent on terminal flowers of the cluster.

Studying the changes occurring in Baldwin apples in storage, Latimer found that apples tended to ripen more rapidly in common storage than in cold storage. Large apples colored more rapidly than small apples in both storages, and there was noted a slight loss in weight and in diameter. Electrical resistances decreased slightly in the flesh until February 2, with a slight rise until April, followed by a sharp rise amounting to 10 per cent by May 1. In common storage the tendency for resistance to rise appeared sooner than in cold storage. On an average the resistance of the juice of small apples was 15 per cent greater than that of large apples, indicating that there is a larger amount of ionizable substances in the larger fruits. Freezing point depression of the juice decreased about 5 per cent between January 12 and February 2, with no further change until April 1 when a rise began which reached 10 per cent by May 1. During this period sucrose content decreased 50 per cent.

As determined by S. R. Shimer, G. P. Percival, A. D. Robinson, T. G. Phillips, and Potter, the use of three arsenical cover sprays led to a considerable proportion of the fruits exceeding the legal residue tolerance. Lead arsenate was more adherent than was calcium arsenate. Of the four quarters of a tree, only the fruit of the east quarter varied, due apparently to prevailing winds which prevented complete coverage. Fruit on the lower branches carried more residue than did that on the upper branches. A close correlation was found between the amount of arsenic present and the quantity of lead residue, although the amount of lead removed was slightly less than expected.

Experimental shipments by E. H. Rinear to the Boston market of head lettuce grown at Lancaster, N. H., brought satisfactory returns. The proportion of solid heads on the various plats ranged from 15 to 46 per cent. For some undetermined reason lettuce grown at Colebrook failed to develop properly.

Fertilizer tests by J. R. Hepler indicated that parsnips respond to commercial fertilizer, stable manure, and lime.

[Horticultural investigations at the Washington Station] (*Washington Col. Sta. Bul. 237 (1929), pp. 23, 32, 33, 34–37, 50, 51, 55, 56, 59, 60*).—Continuing studies in spray residue removal (E. S. R., 60, p. 820), J. R. Neller found that the use of lime with arsenate of lead facilitated the removal of the lead but caused some reduction in worm control. Fish oil increased control but like mineral oil rendered cleaning more difficult. Oils of low viscosity were removed most easily.

Jonathan apples that broke down prematurely in storage had high initial and low final catalase activity as compared with normal fruits. Breakdown was apparently associated with an excessively high metabolic rate.

As determined by O. M. Morris, shading by apple foliage, wide spacing of drainage ditches, and competition with weeds and grass hindered the establishment of cover crops. Of five cover crops, yellow sweetclover, white sweetclover, Hubam clover, alfalfa, and hairy vetch, tested in Wenatchee orchards, the white sweetclover produced the largest amount of vegetation. Alfalfa yielded less than half the vegetation secured with the sweetclovers.

Elberta and J. H. Hale peaches harvested when practically full size and well colored kept for 3 weeks at from 45 to 50° F. without material loss in quality. Peaches harvested when the skin first showed yellowish orange failed to ripen properly, and fruits held at from 32 to 33° for 30 days kept apparently normal but browned around the seed and never ripened normally.

Tomato breeding studies conducted by C. L. Vincent yielded some promising seedlings from a cross of Bonny Best and Sutton Best of All.

F. L. Overley and J. R. Magness, in cooperation with other station divisions, found that the use of oil sprays makes cleaning more difficult, especially if the wax has time to accumulate after harvesting. Fish and other drying oils increased the difficulty of cleaning as compared with mineral oils.

That oil sprays may under certain conditions be harmful to the fruit tree was shown in studies conducted by Magness, Overley, and the division of entomology. If buds were perfectly dormant no injury resulted from any of the oils used. A combination of lime sulfur used as a delayed dormant spray and summer oils in the first or second cover sprays caused considerable injury to apples.

Attempts by Morris and H. J. Jensen to root hardwood and softwood apple cuttings were unsuccessful, and observations on the rooting of grafted trees showed so few roots from the scion as to question whether such could support the tree.

Work by Magness and Overley on winter injury to apple roots showed that under a cover of snow the soil freezes lightly, even when air temperatures drop below 0. Roots in the laboratory were injured at about 19°.

The Deacon sweet cherry was found by W. A. Lucé and Overley to be highly promising as a pollinizer for Bing, Lambert, and Napoleon. Anjou spurs bearing an average of 4 leaves failed to bloom the succeeding year, spurs averaging 4.56 leaves bloomed without setting fruit, those with 5.07 leaves per spur set 1 fruit, and those with 5.17 leaves from 2 to 3 fruits. Nitrogen fertilizers increased the set and also the number and total area of the leaves.

Orchard fertilizer studies conducted at Wenatchee by Magness and Overley, in cooperation with the division of soils, showed some response in growth and yield to certain fertilizer combinations.

As determined by Magness, Overley, and Luce, from 15 to 20 leaves are required for each Jonathan apple and about 45 for each Delicious apple.

Studies conducted at the Irrigation Substation by Jensen showed that severe pruning of apples is undesirable. Moderate pruning was gaining on very slight pruning. Color of fruit was not improved by severe pruning. Nitrogen fertilizers increased yields on cultivated plats under irrigation. Withholding of water had an unfavorable effect.

Studies at the Cranberry Substation by D. J. Crowley were interfered with by severe frosts in June, and the balance of the crop was injured by lack of adequate rainfall. Cranberries grown on plats receiving a delayed dormant lime sulfur spray kept no better than those from plants not receiving this spray. Resanding to a depth of 1 in. decreased the stand of plants and increased the percentage of diseased berries. Sodium chlorate gave somewhat better results than did calcium chlorate in the control of weeds in cranberry bogs. In some plats treated with sodium chlorate in June 100 per cent control of horsetail rush was secured.

The stigma as a factor in pollination [trans. title], E. Katz (*Flora* [*Jena*], *n. ser., 20* (*1926*), *No. 3, pp. 243–281*).—Working with various flowering plants, such as petunia, snapdragon, and cestrum, it was observed that under natural conditions the stigmatic fluid is indispensable to successful pollination, its function being a protection of the pistil and pollen from desiccation rather than any chemical stimulus. Through its content of oil, the stigmatic fluid decreases transpiration and holds the necessary moisture for the growth of the pollen tube. In addition to a very definite content of oil, there was noted a positive reaction to fuchsian and gentian violet stains, an indication, according to Molisch, of the presence of gums. Chemical analyses of the stigmatic fluid were difficult on account of the small quantity but showed considerable variability.

The most favorable time for pollination was at the period of most rapid secretion of the stigmatic fluid. Secretion was stimulated by light and heat. Where secretion was inhibited by darkness and low temperature no pollen germination occurred on the dry stigma. Removal of the stigma did not prevent pollination, provided secretion was present on the cut surface of the style. In many species almond oil was found a satisfactory substitute for stigmatic fluid when placed on the stigma, but in artificial cultures it was found necessary to have water present with the oil to insure pollen development. Tubes in this artificial medium were short and quickly flattened at the growing tip. In most cases germination was increased by the addition of a piece of stigma of the same species to the oil culture.

Fruit pollination, A. E. Murneek (*Missouri Sta. Bul. 283 (1930), pp. 12, figs. 8*).—A general discussion of the pollination problem with reference to commonly grown tree and small fruits, with suggestions as to proper interplanting of varieties, importance of maintaining vigor, use of bees, top working, etc., as means of securing adequate pollination.

Some experiments with ultra-violet ray glasses, M. A. H. Tincker (*Jour. Roy. Hort. Soc., 55 (1930), No. 1, pp. 79–87*).—At the Wisley Laboratory, England, two new types of glass which permit the passage of light rays of shorter wave lengths than pass through ordinary glass were compared with ordinary glass as to their effect on vegetable plants growing in frames in which all other conditions were maintained as uniformly as possible. The temperature in summer was somewhat higher under the new types of glass, but when the temperature was regulated no difference was found in the growth rate of lettuce, although radishes and carrots produced statistically significant larger yields under the two new types of glass.

The complete book of gardening, J. Coutts, A. Edwards, and A. Osborn (*London and Melbourne: Ward, Lock & Co., 1930, pp. 768, illus. 161*).—A comprehensive manual of English gardening practice.

Flowering habits of cabbage [trans. title], F. von Kotowski (*Gartenbauwissenschaft, 1 (1928), No. 4, pp. 375–384, figs. 7*).—Studies at Warsaw, Poland, showed that flower production is about eight times larger on the main stalk than on the side branches of the cabbage. The main stalk bloomed over a shorter period than the side branches. Flower production could be expressed by the equation for the speed of an autocatalytic monomolecular chemical reaction. Flowering on the main stem was monophasic and that on the side shoots diphasic. No correlation was found between the number of seed stalks and the quality of seed. The earliest flowers yielded the best seeds.

The effect of selection in the tomato, C. E. Meyers and M. T. Lewis (*Pennsylvania Sta. Bul. 248 (1930), pp. 20, figs. 5*).—Long continued studies lead to the conclusion that any given tomato population can not be indefinitely improved by plant selection, that is, once a strain has become stabilized further selection fails to produce any significant effect. For example, five generations of selection within a stabilized strain of Earliana failed to increase yielding capacity to any appreciable extent, and comparable results were secured with five other varieties selected through two generations. That selection for earliness within a stabilized tomato population is also futile was indicated in studies of three commercial strains of Earliana which supposedly differed in time of ripening. However, no significant differences in early production were recorded.

The individual plant is conceded to be the unit in selection work with the tomato, but once the strain is pure no further selection was effective in intensifying desirable characteristics. The tomato is described as essentially self-pollinating, but it was noted that a small percentage of crossing occurs under favorable circumstances, necessitating roguing the seed plats.

Ethylene treatment of tomatoes, E. F. Kohman (*Calif. Fruit News, 81 (1930), No. 2180, p. 11*).—As determined by the National Canners Association, tomatoes which already showed red color did not respond to ethylene, coloring no faster than did control lots. Tomatoes showing no red responded to ethylene, but since immature fruit is inferior and has no place in canning, the ethylene treatment is conceded of no value to the tomato canning industry.

Progress of orchard windbreaks, F. P. Eshbaugh (*[Oklahoma] Panhandle Sta., Panhandle Bul. 15 (1930), pp. 15–19, fig. 1*).—Supplementing a general discussion on the function of windbreaks, data are presented on several plats established at the Panhandle Station in 1928. A correlation of 0.4911±0.08 was determined between total growth and average soil moisture, indicating a direct relation between the two. In respect to height, apricot made the greatest development, with Chinese elm next. Scotch and jack pines practically all died out in the first two years. Apricot showed better survival than Russian mulberry, Chinese elm, Osage orange, red cedar, and jack and Scotch pines.

Biometrical studies of the apple tree [trans. title], V. Levoshin (*Izv. Saratov. Obshch. Estest. (Ber. Saratov. Naturf. Gesell.), 3 (1929), No. 1, pp. 47–72, figs. 2; Eng. abs., p. 71*).—Positive correlation was found between the height of the apple tree and the diameter of the head, but no correlation was determined between the number of main branches and the diameter of the head or the diameter of the trunk. The angles of deviation formed by the main and secondary branches were rather constant varietal characteristics, and positive correlations were found between the angles of the main branches and the diameter of the head. No definite relation was found between diameter and height of trunk either in the nursery or in 20-year-old trees.

Hybridization studies with the apple [trans. title], F. Bach (*Gartenbauwissenschaft, 1 (1928), No. 4, pp. 358–374, fig. 1*).—Controlled self- and cross-pollinations with a number of leading German varieties of apples led to the statement that the varieties in general proved practically self-sterile and benefited by cross-pollination. Among six varieties listed as good pollinizers are the Yellow Bellflower and the White Calville. Boskoop, on the other hand, proved a very poor pollinizer. Xenia is believed to be very rare in the apple and to occur only in certain crosses and then not uniformly. The number of seeds in any given variety was definitely influenced by the pollen parent.

Methods of heading young apple trees and the importance of this problem, W. A. Ruth and V. W. Kelley (*Ill. State Hort. Soc. Trans., 63 (1929), pp. 208–217, figs. 2*).—A discussion of the principles and practices of training newly planted apple trees by the high heading and disbudding system.

Soil management experiments with the application of fertilizers in apple orchards, F. W. Hofmann (*Virginia Sta. Bul. 269 (1930), pp. 35, fig. 1*).—A statistical analysis of data obtained in experimental orchards at Blacksburg, Crozet, and Winchester, supported by experimental evidence in neighboring States, leads to the observation that a combination of nitrogen, phosphoric acid, and potash is most desirable for apple orchards of the region. Nitrogen alone gave the most pronounced gains in yield, but for the maximum yields and the best quality of fruit it is advised that phosphoric acid and potash should be used in correct balance with nitrogen. It is suggested that in order to maintain an adequate reserve for the needs of fruit trees growing in soils such as those at Blacksburg and Crozet it is advisable to restore at least the amounts of the three essential fertilizer elements that are removed in the picked fruit. A 7–2–5 (N–P–K) ratio is suggested for the minimum needs of orchards, but to provide for the nutrients tied up in the wood removed with the prunings and required for special cover crops it is suggested that a 7–6–5 ratio for soils not planted to legumes or low in nitrogen and a 4–8–5 for those planted to legumes or moderately rich in nitrogen be utilized. As a practical deduction it is suggested that the individual grower should make certain trials of his own to ascertain the best fertilizer program.

Negative effect of the stock on the ripening of the Beurre Diel pear [trans. title], G. RIVIÈRE and G. PICHARD (*Bul. Mens. Soc. Natl. Hort. France, 5. ser., 3 (1930), Mar., p. 130*).—No material difference in the time of ripening was noted in the case of Beurre Diel pears worked on four different pear stocks.

Progress report of prune storage and maturity studies, C. C. VINCENT, L. VERNER, and E. C. BLODGETT (*Idaho Sta. Bul. 167 (1929), pp. 19, figs 5*).—Citing the rapidly increasing production of fresh prunes in the Western States as a need for the improvement of methods of handling the crop, the authors report on storage studies in the Boise Valley in which it was found that at 32° F. Italian prunes could be safely held for several days. Of indexes to maturity, the pressure test proved more satisfactory than did sugar and acid determinations, the latter being too susceptible to error for use under practical orchard and storage conditions. In the case of fruit for storage, pressure readings ranging from 11.5 to 9.5 lbs. were found more satisfactory, while for immediate shipment the range was somewhat wider, 11.5 to 8.5 lbs. Prunes picked above 12 lbs. pressure kept well but did not develop full quality.

Variation in ripening of fruits on a single tree was found a serious handicap to successful storage, the storage being limited to that of the ripest fruits. Prunes increased 0.5 per cent per day in size from the time they first showed solid red color until they reached maximum size, after which there was a shrinkage. Humidity in the storage room decreased shriveling, a serious cause of losses, but increased the tendency to decay. Rapid deterioration, roughly proportional to the length of the storage period, followed removal of fruit from storage and suggested the need of rapid disposal of stored fruit.

Hardy peach buds, M. J. DORSEY (*Ill. State Hort. Soc. Trans., 63 (1929), pp. 452–458*).—Stating that the period of physiological dormancy in the peach fruit bud is very brief, perhaps less than one month in duration, the author discusses various factors, such as adaptation of the variety, maturation of the wood in autumn, and cultural practices and fertilization which may affect hardiness. In an experiment at Tunnel Hill, Ill., annual applications over a 4-year period of 8 lbs. of nitrate of soda per tree failed to lower the temperature resistance of peach fruit buds.

The physiology of growth of grape blossoms [trans. title], O. SARTORIUS (*Angew. Bot., 8 (1926), Nos. 1, pp. 29–62, figs. 16; 2, pp. 65–89, figs. 6*).—In studies conducted at the Botanical Institute of Heidelberg and in the field the development of the flowering shoot and flower buds of the grape was traced cytologically and observations made upon the effect of various environmental factors on blossoming and pollination. It was observed that the flowering performance was already determined in the overwintering buds. Very little nourishment was needed in the spring up to the actual blooming stage, and temperature was the most potent factor concerned in the development of flowers. Opening of the blossoms occurred as a rule between 6 and 8 a. m., and in good weather expansion of the blooms took place very rapidly. Apparently the buds developed to a certain stage in which they persisted until optimum conditions obtained. A certain periodicity in flower opening was noted, first the morning opening and again between 2 to 4 p. m. Light and moisture seemed to have little influence on blooming.

The author concludes that the grape is self-fertile, although cross-pollination was easily accomplished. Viability of pollen is conceded the most important factor concerned in the setting of fruit. In artificial cultures pollen growth was excellent at 30° C., decreasing with decreasing temperatures until at 15° germination and fruiting were uncertain. In cold weather pollen sometimes remained dormant.

Vine pruning studies in Neuchâtel [trans. title], C. Godet (*Ann. Agr. Suisse, 31 (1930), No. 1, pp. 48–92, figs. 14*).—Four types of pruning, two short and two long, were studied by the Swiss Experimental Station for Viticulture at Auvernier in respect to their influence on growth, yield, chemical composition, and flavor of the resulting wine. In general the long pruned vines produced the larger crops but did not result in the highest quality wine. The chemical composition of the wine was little influenced by the type of pruning, the differences being in flavor. The author points out, however, that in adopting systems of light pruning spacing of the vines would need considerable modification because of the greater root and top development. Long pruning is not considered sufficiently tested in the region to warrant its general recommendation, but the cordon system is proposed as a sensible compromise. The soil in the experimental vineyard contained from 25 to 33 per cent of calcium, and the H-ion concentration was between pH 7.3 and 8.1, causing a marked tendency to chlorosis on certain rootstocks.

Olive thinning and other means of increasing size of olives, H. E. Drobish (*California Sta. Bul. 490 (1930), pp. 20, figs. 6*).—As size of fruit plays a material part in the returns from olive groves, studies were made of fertilization, pruning, and fruit thinning as factors in increasing the size of the olives. Heavy applications of nitrate of soda increased twig growth, resulting in a heavy set of small olives the succeeding year and no crop the next. Summer pruning, although removing a considerable percentage of the olives, failed to increase the size of those remaining. Hand thinning of overloaded trees was, on the other hand, very successful, increasing fruit size, promoting earlier maturity, decreasing the hazards of frosts and shriveling, and reducing the tendency to alternate bearing. Late harvesting apparently did not influence the set of the succeeding year. Based on the studies practical recommendations are given.

Experiments with the strains of the Japanese chestnut [trans. title], Y. Tanaka (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 1 (1929), No. 3, pp. 314–379, pls. 14; Eng. abs., pp. 375–379*).—Technical descriptions with a key are given for 45 strains of Japanese chestnut (*Castanea crenata*) growing at the Imperial Horticultural Experiment Station, Okitsu, Japan. In an appendix a discussion of the scientific name of the Japanese chestnut is given by T. Tanaka.

Lilac culture, J. C. Wister (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trubner & Co., 1930, pp. 123, pls. 11, figs. 12*).—A handbook of general information for the home owner.

The rose manual, J. H. Nicolas (*Garden City, N. Y.: Doubleday, Doran & Co., 1930, pp. XVIII+335, pls. 12, figs. 15*).—An encyclopedia for the American amateur.

FORESTRY

Timber growing and logging practice in the Northeast, S. T. Dana (*U. S. Dept. Agr., Tech. Bul. 166 (1930), pp. 112, pls. 21, figs. 26*).—This is another bulletin (E. S. R., 62, p. 45) in a series devoted to measures necessary to keep forest lands of the United States productive and to produce full timber crops. A total of 9 States, New England, New York, New Jersey, and Pennsylvania, are grouped and divided into five forest regions for each of which detailed information is presented on the species composition of the forest, general characteristics, rates of growth, yields, silvicultural requirements, etc. Fire control is, as usual, conceded the most important item in keeping forest lands productive, and various thinning and selection practices are discussed with a view to obtaining the maximum returns.

Pulpwood crops in the Northeast, M. WESTVELD (*U. S. Dept. Agr. Leaflet 57 (1930), pp. 8, figs. 5*).—Suggestions are presented upon methods of managing pulpwood stands to obtain continuous profitable crops. Among points considered are release cuttings, the girdling of unprofitable hardwoods, and thinnings to encourage rapid growth of the ultimate pulpwood trees.

Management of farm woodlands in Louisiana, G. D. MARCKWORTH and R. MOORE (*Louisiana Stas. Bul. 209 (1930), pp. 21, figs. 9*).—A presentation of general information on the planting and care of the farm wood lot, the marketing of lumber products, and the potential yields and returns therefrom. Yield tables are presented for loblolly and shortleaf pines, both in terms of board feet and cords per acre.

DISEASES OF PLANTS

Plant diseases, F. T. BROOKS (*London: Oxford Univ. Press, Humphrey Milford, 1928, pp. VII+386, pl. 1, figs. 62*).—"Although the subject of plant pathology has assumed great scientific and practical importance, there has been no general, up-to-date account of the diseases of British crop plants available for some years. The present book endeavors to supply this deficiency. In it the author has also attempted to include an outline of our present knowledge of important plant diseases in other parts of the Empire and in other countries of the world. . . . It is hoped also that the book will be useful to the general botanist, to students of agriculture, horticulture, and forestry, and to those cultivators of the soil who take an enlightened interest in the crops they grow. . . .

"The common names assigned to the diseases of British crops are those which have been compiled by the plant pathology subcommittee of the British Mycological Society."

Discussion on " Ultramicroscopic viruses infecting animals and plants " (*Roy. Soc. [London], Proc., Ser. B, 104 (1929), No. B 733, pp. 537–560*).—Contributions, some having wide applicability, of fact and of critical discussion bearing upon plant diseases are indicated below.

In the opening presentation, C. Martin stated that in the highly heterogeneous group of more than 100 virus diseases now known to affect plants and animals, including man, there is nothing clinically or epidemiologically peculiar, though the associated bodies are distinguished from visible microbes by their smaller size and their present apparent inability to thrive apart from living cells. "Considerable support is given to the view that viruses are obligatory parasites by the apparent absence of saprophytic viruses."

P. A. Murphy stated that virus diseases of plants may be capable of mechanical transmission or they may be conveyed through plant bodies as in grafting or budding. The systemic character of plant virus disease (though in most cases the seeds are not invaded) contrasts with the localization which is characteristic of almost all those caused by fungi, bacteria, or protozoa. A few recent cases may have occurred of plants apparently recovering from a virus disease.

The same plant may be attacked by numerous recognizably, and (supposedly) permanently, different mosaic diseases. A virus may be attenuated, to an extent yet undetermined, by passage through a slightly reacting plant. Insects act as vectors of plant viruses with great frequency, though some very infectious viruses are spread in various other ways.

J. A. Arkwright discussed chiefly the virus of foot-and-mouth disease, claiming that the only alternative to the view that the virus is an independently living microbe appears to be that it is a metabolic product of the animal tissues.

J. E. Barnard dealt mainly with the needs, possibilities, and efforts to improve the appropriate microscopical method and the technic of filtration.

K. M. Smith dealt with the matter of direct transmission of plant virus by vectors and that of cases in which the full development of the evidences after transmission takes time, also with those in which there appears to be some obligate connection between the virus and its insect carrier, as exemplified by differences observable after transmission due to different carriers. "By certain manipulation of the virus of potato mosaic, it is therefore possible to change its character and, by starting with the normal mild disease upon potato, to produce from it four apparently distinct diseases, or perhaps it would be more accurate to say, four distinct modifications of the virus, i. e., (1) ring spot of tobacco, (2) its highly infectious counterpart in potato, (3) the virulent form of disease in tobacco, [and] (4) the aphis-produced green line disease, also in tobacco."

W. E. Gye showed as the result of studies on so-called filtrable fowl tumors that in these tumors the essential phenomenon of filtrable virus disease is present. Apparently the agent can reproduce itself indefinitely in the infected tissues. If the filtrate be heated to 55° C. for 15 minutes it is inactivated, a somewhat lower temperature or a shorter time simply attenuating the agent in filtrate.

J. C. G. Ledingham dealt briefly with contributions to the knowledge of viruses, and their interactions with the tissues of the host.

R. N. Salaman remarked on certain general principles deduced in connection with the work on the potato, as done in Cambridge. It has been regarded as possible that disturbances caused by the introduction of foreign protoplasm on a host plant may cause virus disease. It is here concluded that virus disease of potato or of tobacco is not due to mere physiological disturbance. "Tolerance" may enable one to distinguish two viruses which produce identical symptoms. Varietal reaction must be allowed a vital part in such investigations.

F. W. Twort considered it reasonable to suppose that viruses may be pathogenic representatives of forms more primitive than bacteria, which are now much too highly organized to represent the start of life. Nonpathogenic varieties may also exist, as at present pathogenicity is our only means of discovering such forms. Judging from what is known of ordinary bacteria, nonpathogenic viruses may exist. The bacteriolysin (bacteriophage) may belong to a group that under certain conditions becomes pathogenic for the bacterium and is detected when lysis occurs. It is suggested that if viruses are representatives of very primitive life, having existed before the organic world was evolved, the energies of viruses may have been formerly, and may even now be, obtained from some other source than that of organic materials.

C. H. Andrewes called attention to differences between the bacteria and viruses as regards immunity, suggesting that defense of itself by the organism against such minute intracellular parasites as viruses are presumed to be may be rather different from its mode of protection against visible bacteria.

S. R. Douglas contributed observations on the migration of viruses in an electric field and on the distribution of viruses.

E. Hindle, calling attention to the alleged fact that the yellow fever virus apparently has a size in the blood different from that in the transmitting mosquito and also to the fact that in different epidemics the mortality ranges from an average of 10 per cent up to 90 per cent, argued that there are here phenomena corresponding strongly with those shown in case of living organisms. Features of immunity, however, in certain virus diseases appear to be distinct from those which are apparent in certain bacterial diseases.

W. B. Brierley emphasized the specificity of insect transmission in certain plant diseases.

A. E. Boycott, admitting analogies known to exist between viruses and bacteria, pointed out other analogies not necessarily involving living things, as in case of foot-and-mouth disease and cancer. He concluded that, while whole series of agents exist which are capable of multiplication and of causing a variety of effects resembling those of a bacillus or of a growth-promoting substance, it appears impossible to determine as yet where to place these various agents.

Studies on the association of certain phytopathogens, J. E. Machacek (*Quebec Soc. Protect. Plants, Ann. Rpt., 20 (1927–28), pp. 16–63, figs. 11*).—A study has been made of organisms both parasitic and saprophytic in their associations principally on a number of fruits and vegetables, with hindering and favoring factors, the most influential of the latter being temperature. The results are considerably detailed.

Active immunization in plants [trans. title], D. Carbone (*Centbl. Bakt.* [*etc.*], *2. Abt., 76 (1929), No. 25–26, pp. 428–437*).—An account is given of the literature and of recent studies on the possibilities and the practical aspects of producing, maintaining, and transmitting resistance to certain diseases of plants.

Acquired immunity in plants [trans. title], C. Arnaudi (*Atti Soc. Ital. Sci. Nat. Milano, 64 (1926), No. 3–4, 230–238*).—In this account of studies carried out in two groups, the author presents views less unfavorable to the idea of disease resistance in plants than those hitherto held. Work related to the present undertakings has been done by Carbone (E. S. R., 50, p. 345; 57, p. 146) and by Haberlandt (E. S. R., 49, p. 219).

Recent experimentation on the production of disease immunity in plants [trans. title], C. Arnaudi (*Riv. Patol. Veg., 18 (1928), No. 7–8, pp. 161–168*).—Referring to contributions including his own work above noted, the author cites the results which are held to favor the view that a specific immunity can be produced in plants by a procedure analogous to vaccination.

The facultative parasitism of some ordinarily saprophytic fungi [trans. title], L. Montemartini (*Riv. Patol. Veg., 17 (1927), No. 5–6, pp. 115–117, figs. 2*).—Calling attention to one of two accounts by Young (E. S. R., 58, p. 241; 60, p. 322) regarding the relations between parasitism and saprophytism, the author briefly notes certain reactions of wounded potato tubers to the presence of *Penicillium glaucum*.

Studies of the effects of certain organic and inorganic acids on Sclerotinia sclerotiorum, C. C. Zeliff (*Amer. Micros. Soc. Trans., 47 (1928), No. 4, pp. 468–473, fig. 1*).—The optimum hydrogen-ion concentration for the strain of *S. sclerotiorum* used in the present study is about pH 3.2, though this fungus will grow in a nutrient solution at concentrations between pH 1.5 and pH 10, the exact limit on the acid side depending upon the particular acid used.

Inhibition of growth by acids supposedly depends upon the relative toxicity of the hydrogen ion, anion, and the undissociated molecules.

The order of decreasing toxicity of the acids on the basis of pH is lactic, citric and oxalic, hydrochloric, and phosphoric.

[Plant pathology at the New Hampshire Station] (*New Hampshire Sta. Bul. 250 (1930), pp. 19, 20, 25, fig. 1*).—As determined by O. Butler and R. R. Jenkins in experiments with sunflower, tomato, bean, cucumber, and castor oil and potato plants, only a neutral or a very slightly alkaline Bordeaux mixture can be safely applied to greenhouse plants subject to fumigation with cyanide. The cause of the injury is believed due to the formation of cupric cyanide, which decomposes with the liberation of cyanogen in the case of those mixtures which are toxic when the foliage is not wetted, or to the formation of an alkaline double cyanide in case of the mixtures which show toxicity when wetted or increased toxicity on being wetted.

Butler found that four sprays were required in 1928 to obtain 66 per cent control of scab on apples, and it is believed that five sprays would have given better results. Lime sulfur solution, 1:50, was used with insecticides added in the prepink and calyx sprays.

A close correlation was found by Butler to exist between temperature and the appearance of mosaic symptoms in potato stock. On Irish Cobbler plats at East Kingston deterioration from leaf roll was effectively prevented by early harvesting. Small seed produced plants as free from leaf roll and mosaic as standard size seed.

[Plant pathology at the Washington Station] (*Washington Col. Sta. Bul. 237 (1929), pp. 15, 16, 38–41*).—Inoculation experiments conducted by E. F. Gaines and W. K. Smith with 7 strains of bunt on 20 varieties of wheat, 10 winter and 10 spring, showed variable results. One strain was more virulent on the winter wheats than on the spring wheats, and 6 of the 10 spring wheats were highly resistant to all 7 strains of bunt.

In another study with a virulent form of bunt (*Tilletia levis*) found in the wheat fields of eastern Washington, more than 100 varieties and hybrid winter wheats which had proved resistant to another form of bunt were highly susceptible, producing from 50 to 90 per cent of smutted heads. Ridit, Hohenheimer, a recent Turkey selection, and 4 hybrids containing Ridit parentage were smut free. Of the spring wheats, Marquis was the only important variety to show high resistance, though many new introductions and hybrids had less than 5 per cent infection. Four selections were immune both in 1929 and 1928 when a mixture of 4 smut strains was used as an inoculum.

As reported by F. D. Heald and J. Kienholz, solid media, such as potato-4 per cent sucrose agar, proved very successful for growing smut. However, no specific differences were observed among 10 strains sufficient to permit identification. Tests with a gas grain treater gave unpromising results, and no new fungicides for smut superior to copper carbonate were discovered.

Of several materials tested by L. K. Jones, L. E. Miles, and B. Villanueva as a treatment for Rhizoctonia of potatoes, mercuric chloride gave the best results. Organic mercury disinfectants did not in any case increase yields. In work with various vegetable and flower seeds, treatment with mercury disinfectants increased the stands from 12 to 18 per cent. Watering the soil prior to sowing the seed was more beneficial than watering immediately after planting. The treatment of pea seed with disinfectants apparently stimulated early growth, but had no permanent value because treated plants with their luxuriant growth suffered more during later droughts.

A survey by Jones and G. A. Newton of raspberry plantations in the Puget Sound region showed that virus diseases were working havoc on black raspberries but causing relatively little damage to red raspberries as compared with the conditions in the central and eastern parts of the United States. True mosaic was severe on the red raspberry in the Spokane Valley.

Streak was induced in greenhouse tomatoes by rubbing the foliage with the combined juice from mosaic tobacco and potato plants. Pruning and cultural practices are said to have spread streak, which was found capable of reducing tomato yields by 25 per cent.

Beet mosaic was found very prevalent in the Puget Sound beet seed growing district, the percentage of infected plants being practically 100.

Plant disease notes taken by Heald, Jones, and Newton include observations on a wilt or stem rot of alfalfa, apple blotch, apple chlorosis, and a black spot of larkspur.

Plant diseases of lower Quebec during 1927, E. Campagna (*Quebec Soc. Protect. Plants, Ann. Rpt., 20 (1927–28), pp. 86–91*).—This account deals with diseases of plants, including separately cereals, forage plants, fruit trees, ornamentals, and forest trees.

Report of provincial plant pathologist, Vancouver, J. W. Eastham (*Brit. Columbia Dept. Agr. Ann. Rpt., 22 (1927), pp. 34–37*).—Notes are given as regards potato spindle tuber, witches' broom, mosaic, streak, and seed treatment; tulip fire (*Botrytis tulipae*); artichoke stem rot (*Sclerotinia sclerotiorum*); apple scab; and a few greenhouse diseases, particularly of tomatoes and cucumbers.

Work connected with insect and fungus pests and their control, F. G. Harcourt (*West Indies Imp. Dept. Agr., Dominica Agr. Dept. Rpt. 1926–27, pp. 5–7*).—A report is made of a sporadic but widespread outbreak of a red root disease of limes caused by a Sphaerostilbe of undetermined species favored by conditions prevailing recently. Observations are recorded in comparison with this disease. Rosellinias appear negligible. A survey showed a considerable part of the island of Dominica to be free from the Panama disease. A cocoa disease appearing on a large estate was identified as Sphaeronema black spot and bark rot.

Plant diseases and pests in Denmark, 1926 [trans. title], E. Gram, C. A. Jørgensen, and S. Rostrup (*Tidsskr. Planteavl, 33 (1927), No. 5, pp. 781–841; Eng. abs., pp. 839–841*).—Both animal pests and cryptogamic parasites are reported. Barley was damaged by net blotch (*Pleospora teres*), and particularly by foot rot (*Fusarium culmorum* and other fungus forms), which also damaged wheat and other cereals. *Gloeosporium caulivorum* was discovered in *Trifolium pratense* and *Helminthosporium anthyllidis* in *Anthyllis vulneraria*. A case of *Ascochyta betae* was noted. Beet nematode (*Heterodera schachtii*) was found on cauliflower, radish, garden turnip, and red garden beets. *Alternaria radicina* occurred on roots and shoots of carrot seed plants. Potato late blight (*Phytophthora infestans*) appeared early, lowering yield. *Coniothecium chomatosporum*, determined as new for the country, was located in deep cracks of apples from two different localities. *G. ribis* and *G. curvatum*, with *Septoria ribis*, caused throughout the country serious leaf fall in gooseberries and both black and red currants. *Oidium hortensii* has been introduced into most nurseries. *Puccinia mirabilissima* occurred in several places on *Mahonia aquifolium*.

Although disinfection experiments with barley and wheat gave no definite results, treatment of beet seed improved germination. For potato late blight control, a spray prepared from a proprietary copper-soda powder proved practically equal to homemade Bordeaux mixture, although when this powder was dusted on it injured the leaves. The dust Nosperit proved rather efficient. Pota in sufficient quantity showed a distinct effect. Bordeaux mixture surpassed all the dusts.

Phytopathological notes [trans. title], L. Montemartini (*Riv. Patol. Veg., 18 (1928), Nos. 1–2, pp. 1–7; 5–6, pp. 93–96*).—Notes are given on certain cryptogamic diseases of several plants.

The influence of seeding time on the development of cereal rusts [trans. title], C. Brega (*Riv. Patol. Veg., 17 (1927), No. 7–8, pp. 153–156; 18 (1928), No. 7–8, pp. 153–160*).—The author presents in the earlier of these reports the results of tests carried out with cereal varieties during the period from October, 1926, to March, 1927, as to the connection between the time of seeding and rust development. Early seeding seemed to favor rust outbreak. The first show of rust (*Puccinia glumarum*) occurred when the temperature was not yet above 18° C. (64.4° F.). *P. graminis tritici* was more abundant, but *P triticina* was sporadic and less abundant. Supposedly, the effect of seeding time on rust outbreak will vary from year to year according to the time of dispersal of the infecting material.

Of the second set of tests, made in three localities during 1927–28, an account is given in tabular form, with discussion in connection with statements as to temperature and rainfall. Seeding with different varieties was carried out at intervals from October to March. As to the influence of the age of the seed, no decisive statement was possible. As regards the effect of seeding time upon rust, it appears that the plants of the first seeding are first attacked, but the attacks are more intense and more injurious in the case of the late seedings. Rye develops more rapidly than wheat and is also earlier attacked.

It is held that rust infection requires, for its development, that the plant present a certain stage of development and that the surrounding temperature be sufficiently high. In the early spring the plants first appearing are in a situation to be first attacked, but the conditions do not allow very intensive attack. Later the plants from late seedings meet, in their period of greater susceptibility, the external conditions which also favor attack. Hence, at this time the epidemic outbreak and the general injury.

Osmotic characters conditioning resistance to cereal rusts [trans. title], A. Draghetti (*Riv. Patol. Veg., 18 (1928), No. 3–4, pp. 41–64, fig. 1*).—The hypothesis of osmotic factors conferring resistance in plants to fungus parasites is based on the present knowledge of plant physiology, on knowledge of the biology of adaptation of plant to parasite, and on various other matters which are indicated.

Apparatus for dusting cereal seed [trans. title], Brunehant (*Jour. Agr. Prat., n. ser., 49 (1928), No. 2, pp. 29, 30, fig 1*).—The advantages are pointed out of a cubical box with an axis through opposite corners for the anticryptogamic dusting of cereal seeds before planting.

Dusting of cereal seed [trans. title], E. Tourneur (*Jour. Agr. Prat., n. ser., 49 (1928), No. 7, pp. 131–133*).—Use of a wooden cubical box in which anticryptogamic powders may be shaken with cereal seeds for planting is recommended as economical and effective, increasing crop returns.

Diseases of maize and notes on a parasitic maize weed in Kenya, J. McDonald (*Kenya Colony Dept. Agr. Bul. 20 (1928), pp. 7, pls. 2*).—"Since the last bulletin on maize was published three years ago no new disease of importance has been reported in the European areas, and it still appears to be true, taking the country as a whole, that no outstanding losses due to fungi have occurred. Each year, however, a certain amount of avoidable loss from disease takes place." Although favorable growth conditions for maize in Kenya prevent extensive loss to this crop from diseases, ear rot (*Gibberella saubinetii*) and head smut (*Sorosporium reilianum*) are regarded as capable of doing considerable damage. These are discussed, as is also maize leaf blight (*Helminthosporium turcicum*), for which the name white rust is regarded as unsuitable.

[Ustilago maydis in northern Italy], E. Benigni (*Riv. Patol. Veg., 17 (1927), No. 3–4, pp. 57–72*).—Maize smut, though well known in the areas indicated, has not yet become very important. A brief account is given of the varietal behavior of *U. maydis*, with a discussion of the question as to whether one or more forms of the fungus are present.

Oat smuts, R. J. Noble (*Agr. Gaz. N. S. Wales, 39 (1928), No. 7, pp. 516–518, figs. 2*).—Although both *Ustilago avenae* and *U. levis*, with distinct strains of each, occur on oats in New South Wales, all these smuts are controlled by the same method of seed treatment.

Early seeding in dry soil may germinate the smut spores before the oat seed sprout, in which case the fungus may perish. A clean oat crop may thus result, but grain for seeding should be treated to insure safety.

The structure of the oat grain does not permit a particularly satisfactory penetration by fungicidal dusts, though a copper carbonate dust is preferable to no treatment. Formalin is most effective as a preventive, but seed injury may result. The recommended procedure in applying nearly a gallon of solution per bushel of seed is indicated. The grain, covered for four to five hours with wet bags, will absorb the moisture. It should then be bagged and sown as soon as possible.

Breeding for disease resistance with particular reference to the smut of oats, R. J. Garber, N. J. Giddings, and M. M. Hoover (*Sci. Agr., 9 (1928), No. 2, pp. 103–115*).—It is thought that where, as in the work here reported, it is possible to obtain from a cross segregates more susceptible than the susceptible parent, transgressive segregation may also occur and this possibility may be of value even where neither parent shows complete immunity.

The inheritance of reaction to smut in the oat cross Gopher × Black Mesdag seems to be controlled by a single main factor difference. In addition to this main factor there appears to be at least one supplementary factor, presumably brought in by the Black Mesdag parent, which causes transgressive segregation for susceptibility.

Physiologic forms of oat stem rust in Canada, W. L. Gordon and D. L. Bailey (*Sci. Agr., 9 (1928), No. 1, pp. 30–38, figs. 7*).—In work reported as carried on since 1925 at the Dominion Rust Research Laboratory, Winnipeg, and as greatly assisted by contributions of rust collections, six physiologic rust forms are said to have been isolated in Canada during 1925–1927. Of these, forms 2 and 5 have predominated each year, 3 and 4 appear to have occurred for the first time in Canada, and 6 is reported as a new physiologic form. The heterogeneous or X reaction given by form 5 on Joanette strain and strain 703 is said to occur from single spore cultures. Tests of numerous oat varieties have indicated the extreme virulence of forms 4 and 6.

Ergot on wheat [trans. title], J. Ponsard (*Jour. Agr. Prat., n. ser., 49 (1928), No. 21, pp. 413, 414*).—A brief note is given regarding ergot (*Claviceps purpurea*), which, though common on rye, sometimes attacks wheat, especially the variety Carré Vaudois.

Wheat foot rot [trans. title], M. Lacoudre (*Jour. Agr. Prat., n. ser., 49 (1928), No. 21, pp. 414, 415, pl. 1*).—This brief account includes conditions favoring growth in the two foot rot organisms, *Leptosphaeria herpotrichoides* and *Ophiobolus graminis*.

Dusting for wheat smut [trans. title], F. Desprez (*Jour. Agr. Prat., n. ser., 49 (1928), No. 1, pp. 16, 17*).—Three copper compounds are indicated as preferred anticryptogamic dusts.

The cucumber gall, O. Caron (*Quebec Soc. Protect. Plants, Ann. Rpt., 20 (1927–28), pp. 69, 70*).—There has recently occurred near Montreal and Quebec a disease of stems and young fruits of cucumber. Its somewhat Penicillium-like lesion yields a Cladosporium, presumably *C. cucumerinum*, normally saprophytic but occasionally parasitic.

The effect of Bordeaux mixture on the yield of potatoes during three blight-free years, H. N. Racicot (*Quebec Soc. Protect. Plants, Ann. Rpt., 20 (1927–28), pp. 64–66*).—In 1926 no potato late blight appeared in the part of Quebec indicated in the study here reported, and in 1925 and 1927 there was only a slight trace of this disease. A study of the effect of spraying with Bordeaux mixture in augmenting tuber yields showed substantial but variable gains both in merchantable and in total yield.

Root gallworm in tobacco seed-beds in Nyasaland, C. Smee (*Nyasaland Dept. Agr., Ent. Ser. Bul. 3 (1928), pp. 22*).—This bulletin is an attempt to present to the tobacco planters of Nyasaland an account of work which is being done elsewhere on the root knot tobacco nematode (*Heterodera radicicola*). Among the control agencies discussed are the predatory nematodes (species of the genus Mononchus), chemicals, heat, trap crops, and rotations. *H. radicicola* attacks in Nyasaland a large number of native plants, which are listed with Latin and explanatory English names.

[The control of American gooseberry mildew], R. M. Nattrass (*Jour. Min. Agr. [Gt. Brit.], 33 (1927), No. 11, pp. 1017–1022; 35 (1928), No. 2, pp. 161–167*).—The progress made in gooseberry mildew control in 1925 (E. S. R., 60, p. 450) led to a continuation of the trials in 1926. This work, emphasizing separately in the first of these trials Burgundy mixture and ammonium polysulfide with soft soap, in the second ammonium polysulfide with soft soap, a proprietary soda-sulfur compound with soft soap, and a washing soda with soft soap, gave considerable control with the ammonium polysulfide, a 10 per cent better control on adding a second spraying, and a still better control (but some spotting) with Burgundy mixture. The control in the second experiment was not so good; but the location in this instance was bad on account of overshadowing elms, and heavy showers of rain fell after the second application.

The second account, dealing with experiments in 1925, 1926, and 1927, emphasizes the need for early spraying and for distinguishing suitably between the types of fungicides at disposal. Early application is of prime importance; particularly, the Burgundy type of spray should not be delayed beyond the setting of the flowers. The preblossom stage is best for the powdering or the first spraying. After the mildew appears, a hitting spray containing soap should be used at least twice. The various types of spray can be graded and chosen as to duration of effectiveness. The disadvantages of lime sulfur are pointed out. "A means of control applicable under all conditions is difficult to formulate."

Massaria mori J. Miyake, parasitic on mulberry, and its developmental cycle [trans. title], C. Cappelletti (*Riv. Patol. Veg., 18 (1928), No. 7–8, pp. 133–151*).—A disease affecting the branches of the mulberry is described as occurring in relation with a fungus, two forms of which are described as new species under the names *Fusarium moricolum* and *Dendrophoma moricola*, the perfect stage being *M. mori*.

Experiments in the control of black spot of the vine, H. L. Manuel (*Agr. Gaz. N. S. Wales, 39 (1928), No. 11, pp. 849–853*).—The best results in controlling black spot on grapevines were obtained from use of the swab treatment with iron sulfate 100 lbs., sulfuric acid 10 pints, and water 20 gal.

The Panama disease or banana wilt, J. R. Johnston (*United Fruit Co. Research Dept. Circ. 2 (1928), pp. 8, pls. 5*).—This circular has been prepared to make possible the ready recognition of the Panama disease in the field. A few notes are given on the distribution of the disease and the banana varieties which it attacks.

Studies in the shedding of mango flowers and fruits, Part I, P. V. Wagle (*India Dept. Agr. Mem., Bot. Ser., 15 (1928), No. 8, pp. [3], 219–249, pls. 5*).—Mango is said to constitute the principal fruit crop of the Bombay Presidency, forming in some districts (notably Ratnagiri and Thana) the basis of a considerably commercialized fruit industry. It is subject, owing to the high rate of shedding of blooms and fruit, infertility of the pollen, and some physiological (nutritive) condition, to crop loss which is frequently great and generally variable. This has been considered to warrant a study of the whole question of the shedding of mango flowers and fruits on a broadened basis. The present memoir presents the data collected.

The annual loss due to fall, including blooms that drop before fertilization and the young fruits that are shed, amounts normally with the Alphonso variety at Ratnagiri, to more than 99 per cent of the complete flowers produced. So far as almost all of this loss is concerned, the investigations have not yet disclosed any adequate cause. The few cases showing supposed causes include mildew and certain black spots of undetermined nature on the flower and fruitstalks.

There are said to be two causes capable of affecting materially the quantity of fruits which actually ripen. Apparently, the presence or absence of rain or dew is not among these, but the well-known jassid hopper at Ratnagiri (*Idiocerus niveosparsus*) and the mango flower mildew (*Erysiphe* sp.) affect materially the proportion of flowers which result in ripe fruits.

At Ratnagiri, usually the first flush of flowers, in November and December, is nearly or quite free from both of these organisms. The second flush, in January and early February, has many hoppers but little mildew. The third flush, in late February and March, shows a decrease of hoppers but an increase of mildew.

Control of insects and mildew was only in part successful when spraying was employed. An increase of fall may have been compensated by a subsequent decrease. Bordeaux mixture increased by 21 per cent in 1925–26 and by 230 per cent in 1926–27 the percentage of ripe fruits. When the mildew was present, but hoppers were absent, the fish oil soap solution was doubtful to harmful.

In the presence of hoppers, spraying with fish oil soap solution increased in the flower heads under detailed examination, the yield of ripe fruits by 62 per cent in 1926–27. A combined spray of Bordeaux mixture and fish oil soap solution was not effective even against hoppers.

Imperfections of pineapple fruit, G. C. WALDRON (*Pineapple Technol. Soc., Pineapple Men's Conf. Proc., 1928, pp. 20–23*).—This discussion, giving accounts of pineapple pink rot and fruit internal browning, deals descriptively with what is said to be a new disease of the pineapple. This is a general rot of the entire plant, called distinctively the green fruit rot, and said to be caused by Phytophthora.

A Pleospora attacking Rosa banksiae [trans. title], A. NANNIZZI (*Riv. Patol. Veg., 18 (1928), No. 9–10, pp. 185–191*).—An account with technical description is given of the form of Pleospora attacking *R. banksiae* in the botanical garden of Siena.

Rhizoctonia disease on certain aquatic plants, W. S. BOURN and B. JENKINS (*Bot. Gaz., 85 (1928), No. 4, pp. 413–426, pls. 4, figs. 6*).—In Back Bay, Va., and in Currituck Sound, N. C., duck-food plants (*Potamogeton pectinatus, P. perfoliatus, Ruppia maritima, Vallisneria spiralis*, and *Naias flexilis*) have been destroyed over wide areas by a disease believed to be caused mainly by a Rhizoctonia, pure cultures of a strain of this fungus having been isolated repeatedly from the diseased plants. A disease, identical with that produced by a strain of *R. solani*, has been produced in greenhouse aquaria plants by inoculations with this aquatic fungus, and pure cultures have again been reisolated from these greenhouse plants. Also a disease has been induced on potato plants by inoculations with sclerotia from this aquatic fungus. All the plants above named are attacked by the aquatic strain. Muck soils and a salinity of from 7 to 20 per cent of that in normal sea water (conditions now existing in the waters affected) appear most favorable to the growth and activity of the fungus.

The fungus appears, from the morphological and cultural characters, to be a physiological strain of *R. solani*. This is supposed to be the first appearance on an aquatic plant of this fungus, which is an aggressive parasite on the plants named.

A case of gummosis in maple and in horsechestnut [trans. title], F. GIOELLI (*Riv. Patol. Veg., 17 (1927), No. 5–6, pp. 109–114, fig. 1*).—A gumming disease of maple and of horsechestnut is described. Organisms isolated from the lesions included species of Bacterium, Diplococcum, Fusarium, and Mucor.

Root knot and other eelworm diseases, R. J. NOBLE (*Agr. Gaz. N. S. Wales, 39 (1928), No. 7, pp. 546–550, figs. 3*).—A descriptive account includes *Heterodera radicicola*, *Tylenchus devastatrix*, and *T. dipsaci*, with outline of control measures limited to soil sterilization, crop rotation, destruction of diseased plants, and treatment of bulbs with hot water.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wild life conservation and control in Wyoming under the leadership of the United States Biological Survey, A. M. DAY and A. P. NELSON (*[Cheyenne: State, 1929], pp. [1]+32, figs. 17*).—This discussion is presented under the headings of predatory animal control, rodent control, magpie control, conservation of Wyoming elk, a bibliography of Wyoming wild life conservation and control, and statistical tables.

Ornithology and forest entomology, S. A. GRAHAM (*Mich. Acad. Sci., Arts, and Letters, Papers, 11 (1929), pp. 389–397, fig. 1*) —The observations on birds in their relation to insect control here reported were made in the course of studies conducted in cooperation with the U. S. D. A. Bureau of Entomology and the University of Michigan at the field station of the University of Minnesota Forest School at Itasca Park, Minn.

Absolute humidity as a factor in insect cold hardiness with a note on the effect of nutrition on cold hardiness, N. M. PAYNE (*Ann. Ent. Soc. Amer., 22 (1929), No. 4, pp. 601–620, figs. 9*).—It was found that cold hardiness in the eggs and larvae of the white-marked tussock moth bears a linear relationship to absolute humidity. Eggs are slightly more cold hardy than the first instar larvae, the first instar larvae more than the second, and the second more than the third. Cold hardy eggs tend to produce cold hardy larvae. Cold hardiness of the Japanese beetle in relation to absolute humidity, relative humidity, and environmental temperature has been determined for all three instars of the Japanese beetle larvae and for the adults.

Entomophagous parasites and phagocytes, W. R. THOMPSON (*Nature [London], 125 (1930), No. 3144, p. 167*).—This account supplements that by Brooks previously noted (E. S. R., 62, p. 855).

The Long Ashton tar-distillate wash: Field experiments, 1929, I, II, L. N. STANILAND and C. L. WALTON (*Jour. Min. Agr. [Gt. Brit.], 36 (1929), Nos. 6, pp. 517–523, pls. 2; 9, pp. 828–835, pls. 3, fig. 1*).—This is a report of further work (E. S. R., 61, p. 356).

Chemistry of oil sprays, E. L. GREEN (*Washington Col. Sta. Bul. 237 (1929), p. 22*).—Studies made of the phenomenon variously called agglomeration, flocculation, and curdling of lead arsenate and oil in combination sprays have shown the action of the spray pump to be an important factor. Although agglomeration is difficult to avoid in the spray tank, it is difficult to produce in laboratory glassware.

Pyrethrum experiments, 1928, M. D. AUSTIN (*Jour. Southeast. Agr. Col., Wye, Kent, No. 26 (1929), pp. 124–135*).—The experiments reported indicate that the alcoholic extract of pyrethrum is slightly better than the aqueous extract, and that in some cases, as with the strawberry red spider, it is far superior. In other cases it appears to be at least worthy of a trial in the place of nicotine with soft soap.

[Contributions on economic insects and insect control] (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 13 (1928), pp. 139–151, 162–165, 172–179, 318–331, 351–354, 373–380*).—The contributions presented include the following: Modifications of the Paradichlorobenzene Treatment for Peach Tree Borer, by E. N. Cory (pp. 139–142); Latest Information Concerning the Control of the Codling Moth, by B. A. Porter (pp. 142–151); Orchard Sanitation, by E. N. Cory (pp. 162–165); Spray Injuries on Apples, by W. S. Hough (pp. 172–179); Saving Foulbrood Infected Combs by Sterilization with Formaldehyde Gas, by C. E. Burnside (pp. 318–325); Beekeeping on the Eastern Shore, by A. H. Johnson (pp. 325–331); Mexican Bean Beetle Control, by E. N. Cory (pp. 351–354); and Sheep Parasites, by W. H. Wright (pp. 373–380).

[Work in entomology at the New Hampshire Station] (*New Hampshire Sta. Bul. 250 (1930), pp. 17, 20*).—A check up of the insect injury in apple orchards in 1929 was found to indicate that in individual orchards the number of codling moths caught in alcoholic traps in the spring determines the advisability of using a cover spray for the pest. When 10 or more moths were caught at the same time, a spray proved quite worth while. Moths were found in the plats at the first examination on June 12 in orchards at Hollis, Greenland, and Lyndeboro. They continued to emerge throughout the months of July and August, but no definite peak of emergence occurred. From July 1 to July 20 the number of moths caught gradually increased, and then remained more or less constant until August 20 when the emergence declined rapidly, only a few being caught after August 25.

It was found that the first and second generation phases of the European corn borer are now making contact in the western part of the State, the former, which originated near Schenectady, N. Y., having spread across eastern New York and southern Vermont to meet the second generation phase which occupies the generally infested area of New Hampshire.

Notes on miscellaneous insects of Utah, H. J. PACK (*Utah Sta. Bul. 216 (1930), pp. 32, figs. 9*).—The observations of miscellaneous insects in Utah noted by the late H. J. Pack (E. S. R., 62, p. 799) have been compiled by G. F. Knowlton. These relate to the gooseberry fruit worm, lesser bud moth (*Recurvaria nanella* Hubn.), eye-spotted bud moth, peach twig borer, codling moth, cigar case bearer, sugar beet crown borer (*Hulstea undulatella* Clem.), pale western cutworm, cutworms, the alfalfa looper, strawberry root weevil (*Brachyrhinus ovatus* (L.)), squash bug, potato psyllid (*Paratrioza cockerelli* (Sulc.)), Harmolita spp., namely, the wheat straw worm, wheat sheath worm (*H. vaginicola* (Doane)), and the wheat jointworm, and the occurrence of numerous species of Lepidoptera.

Particular attention is given to the gooseberry fruit worm (pp. 3–12), its life history, habits, a technical description of its larval stages, natural enemies, economic importance, and control. In a supplement (pp. 27–30) the bean thrips is briefly dealt with by Pack and C. H. Smith, a list is given of seven other Thysanoptera collected in the State, and the clover leaf weevil is briefly considered by Pack and L. C. Fife.

[Report of work in entomology at the Washington Station] (*Washington Col. Sta. Bul. 237 (1929), pp. 27–29, 56–59*).—Reference is made to work by

R. L. Webster and W. W. Baker with two species of flea beetle that injure tubers in western Washington in continuation of that previously noted (E. S. R., 62, p. 540). The tuber injury is characterized by an irregular tunneling or pitting which seldom extends to a depth of over 3 mm., although occasionally deeper, but which demands more than the usual amount of peeling when prepared for cooking. The tunnels made in potatoes by the larvae of the western spotted cucumber beetle are sometimes confused with those made by the larvae of the potato flea beetle. Further observations on planting dates indicate that considerable reduction in injury has been obtained by potato growers who have deferred their planting dates until late in June or even early in July. The number of beetles killed by various dusts, including nicotine, fails to show that control by such means is feasible. While many beetles are killed by the use of a 2 per cent nicotine dust, a large number escape unharmed and the benefit obtained falls short of adequate control.

In experimental work with oil sprays by A. Spuler under field conditions they have not given satisfactory results for codling moth control when used alone. Experience with the summer oils during the past three years indicates that their excessive use is likely to be accompanied by injury to trees and a reduction in size of fruits. In codling moth investigations (E. S. R., 61, p. 550), it was found in 1928 that the addition of fish oil to lead arsenate even when used at the rate of 1 lb. to 100 gal. of water (half the usual concentration) resulted in a degree of control approximately equal to that obtained when double the usual amount of lead arsenate was used. In 10 different tests with nicotine sulfate included in the Wenatchee experiments in 1928, when used alone this material gave only about one-half the control obtained by a standard lead arsenate treatment. In order to hold the nicotine longer on foliage and fruit, aluminum sulfate was added in another test, which resulted in greater control but which was accomplished by a distinct russeting of the fruit.

In reporting upon the insect work at the Cranberry Substation by D. J. Crowley, experiments with dormant sprays are considered. Oil sprays both commercial and homemade in dilutions of from 2 to 5 per cent were applied against the cranberry fireworm and scale insects with unsatisfactory results. The dormant sprays were emulsified by the addition of cresoap as outlined in Bulletin 184 (E. S. R., 52, p. 656). In laboratory tests practically 100 per cent control of scale was obtained in all cases where the oil was used in excess of 3 per cent, but poor control was obtained in many of the field plats due in part to the heavy rains that soon followed their application.

Oyster shell scale was found very difficult to control in some bogs, chiefly because of the heavy vine growth. Of the several oils tested in combination with other materials such as nicotine sulfate, pyrethrum soaps, magnesium arsenate, lead arsenate, and free nicotine 40 per cent, mineral seal oil and Volck light oil consistently showed the least amount of injury at the various strengths in which they were used. They were used at all stages of the crop except when the blossoms were open. Three-fourths per cent added to each 100 gal. of either nicotine or pyrethrum sprays increased the toxicity of these insecticides.

Preliminary experiments with a Japanese spray called Neoton showed that the material kills the fireworm but does not penetrate to the webbed insects as well as the nicotine sulfate or the pyrethrum sprays. The fireworm was more abundant in 1929 than for several years, due primarily to the fact that many of the bogs suffered frost injury in 1928 and thorough spraying was not practiced the remainder of the season, leaving a heavy infestation for the 1929 crop.

The fruit worm was parasitized on one bog to the extent of 10 per cent or more by a tiny ichneumonid, the larval and pupal stages of which are passed in the berry, the adults emerging in largest numbers in September.

[Report of the Entomological Branch of Canada], W. R. Motherwell (*Canada Min. Agr. Rpt. 1928–29, pp. 116–138*).—The occurrence of insect pests and the control work conducted during the year are briefly reported upon by divisions (E. S. R., 61, p. 849).

Some notes on injurious insects and other animals in 1928, F. V. Theobald (*Jour. Southeast. Agr. Col., Wye, Kent, No. 26 (1929), pp. 104–116, figs. 5*).—This is an account of the more important pests of the year in Kent, arranged according to crops, etc., attacked.

Report of the director of the Central Entomological Station and the director of the Central Plant Pathological Station for 1928 [trans. title], P. Marchal, E. Foex, et al. (*Min. Agr. [France], Ann. Épiphyties, 14 (1928), No. 6, pp. 415–506*).—This is the annual report for 1928 of the directors of the work in France in continuation of those previously noted (E. S. R., 61, p. 547). Reports summarizing the work of the several laboratories for 1928 by the directors thereof follow.

[Contributions on economic insects] (*Ztschr. Angew. Ent., 15 (1929), No. 2, pp. 229–434, pls. 4, figs. 45*).—Two contributions (E. S. R., 62, p. 449) are here presented, the first dealing with *Tetropium gabrieli* Weise and *T. fuscum* F.: A Contribution to Their Life History and Bionomics [trans. title], by E. Schimitschek (pp. 229–334), and the second consisting of A Contribution to the Life History of the Bark Beetle *Pityogenes chalcographus* L. [trans. title], by F. Schwerdtfeger (pp. 335–427). The former is accompanied by a list of 46 references to the literature and the latter by a list of 90 references.

Reports on insect pests in Ceylon during 1928 (*Ceylon Dept. Agr., Tech. Rpts. 1928, pp. 24*).—This is a report upon the occurrence of and control work with insect pests in Ceylon in 1928, by J. C. Hutson (pp. 1–14), followed by reports of the plant pest inspectors by N. K. Jardine, W. R. C. Paul, C. N. E. J. de Mel, et al. (E. S. R., 60, p. 845).

Soil animals injurious to sugarcane roots, H. Spencer and C. L. Stracener (*Ann. Ent. Soc. Amer., 22 (1929), No. 4, pp. 641–649, pl. 1*).—In this contribution from the Louisiana Experiment Stations the authors report having found root injury to sugarcane by soil animals to be prevalent in all of the sugarcane parishes of the State.

"Experiments with soil animals in hydrometer jars and pails containing growing sugarcane have demonstrated that the root injury known as 'pitting' is due principally to feeding activities of the collembolans *Lepidocyrtus violentus* Fols., *Onychiurus armatus* Tull., and to a less extent by *Proisotoma minuta* Tull., and possibly *Neanura muscorum* Fols. Extensive pitting has been produced experimentally also by the symphylid, *Symphylella* sp., but the springtail *Orchesella ainsliei* Fols. and the snail *Zonitoides arboreus* Say and other members of the soil animal group did not pit the roots.

"A type of root injury apparently more serious to the plants than pitting was observed, especially in experimental pails containing *L. violentus* Fols. This injury has been named 'root pruning' and consists of the almost total destruction of the secondary branch roots by the feeding activities of this springtail. In one test, with numbers of pails sufficient to give dependable averages, sugarcane sprout growth was reduced 14 per cent in the first 8 or 10 weeks in pails containing *L. violentus* Fols., as compared with similar pails in which there were no springtails. The presence of an abundance of humus in greenhouse experiments with the springtails in pails did not prevent injury to sugarcane roots."

Insects affecting the raspberry, W. P. G. Garlick (*Canada Dept. Agr. Bul. 114, n. ser. (1929), pp. 18–23, pl. 1, figs. 4*).—A brief account of some of the more important insect enemies of the raspberry occurring in Canada.

Contribution towards the knowledge of the citrus insects in Palestine, I–III, F. S. Bodenheimer (*Palestine Citrogr., 1 (1928), Nos. 5, pp. 6–8; 11–12, pp. 12, 13, fig. 1; Hadar, 3 (1930), No. 1, pp. 3–8*).—The first part consists of a preliminary report on the work of the Parasite Breeding Laboratory at Petah-Tikwa, 1924–1927. The second part deals with *Dionconotus cruentatus* Brullé, an important insect pest of orange blossoms in Palestine, and the third part with the zoogeography and ecology of citrus insects, particularly those of Palestine and Mediterranean countries.

Insect enemies and diseases of the orange in Brazil [trans. title], G. Bondar (*Bol. Lab. Path. Veg.* [*Bahia*], *No. 7 (1929), pp: 79, pls. 6, figs. 34*).—A large part of this work (pp. 1–67) deals with the insect enemies of the orange in Brazil and means for their control.

Progress report on sulphur dusting in central California, E. A. McGregor (*Calif. Citrogr., 15 (1930), No. 5, pp. 202, 252, figs. 4*).—In work in 1929, a bad citrus year, the groves with clean fruit were as a rule those that had been dusted with finely ground sulfur three times between April 15 and June 15. The best time for dusting appears to be at the height of blossoming, three weeks later, and three or four weeks following. The amount of sulfur to be applied to average-sized trees should be 100 lbs. per acre for the first dusting, 60 lbs. per acre for the second, and 50 lbs. per acre for the third. The details of control work with the citrus thrips and citricola scale in 1929 through use of sulfur are presented in tabular form.

Report on insect infestation of stored cacao, J. W. Munro and W. S. Thomson ([*Gt. Brit.*] *Empire Marketing Bd.* [*Pub.*] *24 (1929), pp. 41, pls. 4*).—The principal insects of stored cacao found during a survey made by the Empire Marketing Board's committee on infestation of stored products are the coffee-bean weevil, *Corycyra cephalonica* Stain., and *Ephestia elutella* Hb., of which the last mentioned is the most important. Experimental work conducted in connection with this study is briefly reported upon. A list is given of 46 references to the literature.

The progress of biological control of prickly-pear in Australia, A. P. Dodd (*Brisbane: Commonwealth Prickly-Pear Bd., 1929, pp. 44, figs. 16*).—This progress report of control work with the pricklypear (E. S. R., 54, p. 656; 58, p. 700; 59. p. 856) deals with the investigations of the Commonwealth Prickly-Pear Board, the pricklypear insects established in Australia, and the insect enemies of the Cactaceae.

Some factors relating to the feeding habits of grasshoppers, with special reference to Melanoplus bivittatus, G. S. Langford (*Colorado Sta. Bul. 354 (1930), pp. 53, figs. 6*).—The studies here reported, presented in connection with a list of 84 references to the literature, were made with a view to determining the effect of such factors as temperature, light, darkness, and food plant upon grasshoppers, and their relation to control. Temperature was found to be one of the most important factors regulating their rate of growth and daily activities, particularly the amount of food consumed daily. Such factors as light, darkness, and the kind of food eaten appear to have little or no influence on the rate of development. The kind of food eaten determines the volume eaten and the number of times feeding occurs.

Normal activities occur between temperatures of 68 to 100° F. A range of from 98 to 100° in temperature appears to be the optimum. Grasshoppers apparently do not lay eggs when the air temperature is below 69° or the soil temperature 65°. Egg laying has been observed to take place under rather variable moisture conditions, eggs being deposited in sandy soil when the soil moisture content varied from 9.77 to 20 per cent. When a temperature of from 68 to 100° is obtainable, feeding normally occurs throughout the entire day. The amount of food consumed daily per individual varies with the daily temperature.

A note on the use of dried poison bait against locusts in the Sudan, H. H. King (*Bul. Ent. Research, 20 (1929), No. 1, pp. 99–101*).—The use of a sun dried poison bran bait is said to have given satisfactory results, and this method will be the one commonly adopted in the Sudan. Sun dried poison bait has been used also with success against cutworms and should prove effective against field crickets and insects of similar habits.

The life history and control of the rice Hispa (Hispa armigera), S. Vaheeduddin (*Poona Agr. Col. Mag., 21 (1930), No. 4, pp. 203–205, fig. 1*).—This is a brief account of the life history and means of control of *H. armigera*, one of the most serious pests of rice in the Nizam's Dominions.

Observations on the eggs of the apple capsid (Plesiocoris rugicollis Fall.) and the common green capsid (Lygus pabulinus Linn.), M. D. Austin (*Jour. Southeast. Agr. Col., Wye, Kent, No. 26 (1929), pp. 136–144, figs. 4*).—Mention is made of the fact that the results obtained with certain tar distillates, when used against the eggs of *P. rugicollis*, are conflicting in some instances, thus pointing to some factor having an influence over and above the actual ovicidal action of the sprays used. The hardness of the wood of certain varieties of apple is considered a factor likely to have such an influence.

In what way does Bordeaux spray kill the potato leafhopper? D. M. DeLong (*Amer. Potato Jour., 6 (1929), No. 4, pp. 109–114*).—These data are based upon earlier investigations, an account of which has been noted (E. S. R., 61, p. 548). Tests conducted gave a decided indication that Bordeaux mixture is not a contact insecticide but rather a copper poison which enters the insect's body in the cell sap ingested. The leafhoppers die in four or five days. Observations made during the course of experiments indicate that certain symptoms are characteristic of leafhoppers that die from the effects of feeding upon Bordeaux sprayed foliage. The normal greenish color changes to yellow, and in two or three days after treatment the hoppers seem to become weakened or partially paralyzed and fall from the plant. They are unable to get back on the plant or carry on any decided locomotion and in this condition are unable to shed the next nymphal skin and usually die in a partially molted condition.

In experiments in which all strengths of copper from 1 to 5 were used in Bordeaux there was no particular difference in the lethal effect except that the weakest was slightly below the other four. All of the strengths, even the weakest, showed excellent control, indicating that even a small percentage of copper in the Bordeaux is effective for leafhopper control.

Experimental transmission of endemic typhus of the southeastern Atlantic States by the body louse, H. Mooser and C. Dummer (*Jour. Infect. Diseases, 46 (1930), No. 2, pp. 170–172*).—The authors conclude that the virus of typhus from the southeastern United States is able to survive and multiply in the body louse. The louse, then, must be considered as a possible factor in the epidemiology of typhus in southern United States.

Calcium arsenate dusting as a cause of aphid infestation, J. W. Folsom and F. F. Bondy (*U. S. Dept. Agr. Circ. 116 (1930), pp. 12*).—Observations made since 1922 with a view to determining why excessive applications of calcium arsenate on cotton fields are often followed by heavy infestations of the cotton aphid are here reported upon. In studying the effect of frequent and prolonged treatments of plats of cotton under varying seasonal conditions, it was found that a heavy aphid infestation is built up by the killing of hymenopterous parasites when they emerge in the presence of the arsenical. They were killed also, though more slowly, by calcium hydroxide, calcium carbonate, or cornstarch. Predatory insects, especially coccinellids, which destroy great numbers of aphids, were not affected by the calcium arsenate. The initial infestations were found to be due to the positive phototropic reaction of winged females to the white deposit of calcium arsenate. Other white dusts, such as calcium carbonate, starch, or flour, were also found to attract them.

Aphis as a possible vector of "breaking" in tulip species, A. W. McK. Hughes (*Ann. Appl. Biol., 17 (1930), No. 1, pp. 36–42, pl. 1*).—The green peach aphid is suggested as a vector of the virus of transmissible variegation known as breaking in tulips. "Red streak break" is associated with the green peach aphid. *Macrosiphum gei* Koch possibly carries break in a lesser degree and is associated with "white streak." *Anuraphis tulipae* B. de F. and *Rhopalosiphoninus tulipaella* Theob. have both so far shown negative results.

A simple diagnosis of the plant lice of Ribes and apple, F. V. Theobald (*Jour. Southeast. Agr. Col., Wye, Kent, No. 26 (1929), pp. 117–123, pl. 1*).—Keys to the aphids attacking currants and apples and notes on eight species each are accompanied by colored illustrations of the females, seven of the former and six of the latter.

List of the aphid genera proposed as new in recent years, R. Takahashi (*Ent. Soc. Wash. Proc., 32 (1930), No. 1, pp. 24*).—This is a systematically arranged list contributed from the Research Institute, Taihoku, Formosa (Taiwan).

A new spray for scale-insects on citrus in Egypt, N. W. Barritt (*Bul. Ent. Research, 20 (1929), No. 1, p. 44*).—A wash consisting of 3 parts of castor oil and 1 part of resin heated over a flame and stirred until the resin dissolved and then converted into an emulsion by stirring into 50 parts of water containing 1 part of strong ammonia is said to have proved effective against the black scale. Ten days after the spray was applied not a single living scale was found, nor was there any evidence of damage to the foliage.

Contribution to the study of the microsporidian parasites of Pieris brassicae L. [trans. title], A. Paillot (*Arch. Anat. Micros., 25 (1929), pp. 212–230, figs. 12*).—The first part of this account is devoted to a study of the life cycles of the microsporidian parasites of the cabbage butterfly (*P. brassicae*) (pp. 213–222), the second to histo- and cyto-pathological lesions—reactions of the host (pp. 222–225), and the third to the transmission of diseases due to Microsporidia (pp. 225–229). A list is given of 23 references to the literature cited.

Preliminary report upon the occurrence in Argentina of a species of Diatraea new to American fauna, H. E. Box (*Rev. Indus. y Agr. Tucumán, 19 (1928), No. 3–4, pp. 97–103, figs. 2; trans. in Ref. Book Sugar Indus. World, July, 1928, pp. 55, 56, figs. 2*).—The author found sugarcane from Jujuy, Argentina, to be attacked by a species of Diatraea apparently distinct from any recorded in America and which appears in some localities to have gradually crowded out the sugarcane borer. The species differ in the nature of their attack on sugarcane, the unidentified species being capable of more serious damage since it generally makes a series of long tunnels the whole length of the infested stalks, often passing through seven or eight successive internodes. The eggs are parasitized by *Trichogramma minutum*, while the natural enemies of the larvae include *Sarcophaga diatraeae* Brèthes, the commonest parasite of that stage of the sugarcane borer in Tucumán, two species of Microdus, and possibly three species of Iprobracon.

On the identity of the common dipterous parasite of the larva of Diatraea saccharalis Fabr. in the northern Provinces of Argentina, H. E. Box (*Bul. Ent. Research, 20 (1929), No. 2, pp. 199, 200*).—In this contribution from the Agricultural Experiment Station of Tucumán, Argentina, which is a revised translation of an earlier account,[1] evidence is presented to show that the name *Sarcophaga diatraeae* Brèthes given to the common borer parasite is no more than a synonym of *Paratheresia signifera* Towns. This dexiid is an important enemy of the sugarcane borer in Peru, from which country it was originally described, and is considered one of the most efficient larval parasites of Diatraea known. In Argentina the author has reared it in abundance from the Provinces of Tucumán, Salta, and Jujuy. It seems to attack the undetermined species of Diatraea new to America, recently discovered by the author in the Provinces of Salta and Jujuy (as above noted) to at least the same extent as it does the sugarcane borer. In Tucumán the hyperparasite *Aulatopria tucumana* Brèthes has been reared from about 1 per cent of the puparia of *P. signifera*.

Natural enemies of the sugar cane moth stalkborer in Cuba, H. K. Plank (*Ann. Ent. Soc. Amer., 22 (1929), No. 4, pp. 621–640, figs. 7; also in Trop. Plant Research Found.* [*Wash., D. C.*] *Sci. Contrib. 15 (1929), pp. 621–640, figs. 7*).—This is a report of investigations conducted by the Cuba Sugar Club Experiment Station since 1925, which deals particularly with four major parasites of the sugarcane borer, namely, *Lixophaga diatraeae* Towns., *Apanteles diatraeae* Muesebeck, *Bassus stigmaterus* (Cresson), and *Trichogramma minutum* Riley. The minor parasites briefly considered include *Sarcophaga sternodontis* Towns., *S. helicis* Towns., *S. surrubea* V. d. Wp., *S. pedata* Aldrich, and *Chaetopsis fluvifrons* Macq. Several predators are also noted.

The tracheal system of the mature larva of Pyrausta nubilalis Hubn., M. F. Crowell (*Psyche, 36 (1929), No. 4, pp. 332–357, figs. 33*).—This is a detailed account of an anatomical study of the tracheal system of the European corn borer.

Studies on the natural enemies of the corn borer, I, II [trans. title], S. Nakayama (*Chosen Govt. Gen. Agr. Expt. Sta. Ann., 4 (1929), Nos. 2, pp. 95–98, fig. 1, Eng. abs. pp. 97, 98, fig. 1; 3, pp. 173–175, pl. 1, Eng. abs. p. 175*).—Descriptions are given of the tachinid *Ceromasia lepida* Mg. and *Macrocentrus gifuensis* Ashm, which parasitize the larva of the European corn borer.

Arizona to eradicate pink bollworm, M. E. Bemis (*Calif. Cult., 74 (1930), No. 10, p. 284*).—This is a brief discussion of eradication work under way with the pink bollworm, which was first discovered in Arizona on October 24 and later found to infest an area which extended from Tempe east and south from the Salt River Valley, Ariz.

Confirmatory evidence of the validity of the species Pectinophora scutigera Holdaway (Queensland pink bollworm) from a study of the genitalia, F. G. Holdaway (*Bul. Ent. Research, 20 (1929), No. 2, pp. 179–185, figs. 8*).—A study of the genitalia of both sexes of the Queensland pink bollworm (*P. scutigera*), originally named from the immature stages (E. S. R., 60, p. 560), is said to have confirmed the validity of the species. The details of a comparative study of the genitalia of this species and the pink bollworm are presented and figured.

Experiments on the control of the pink boll-worm in Egypt, N. W. Barritt (*Bul. Ent. Research, 20 (1929), No. 1, pp. 41–43*).—The results obtained, while not conclusive evidence of the value of castor oil resin emulsion for the control of the pink bollworm, suggest the possibility of obtaining some control through its use as a deterrent spray. They are also thought to suggest the possible use of protective belts of sprayed plants in fields that have not recently carried a cotton crop and in which buried bolls are not a source of infestation.

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[1] Rev. Indus. y Agr. Tucumán, 19 (1928), No. 5–6, pp. 132, 133.

Stenoma crambina Busck, a new enemy of cotton in the State of Oaxaca [trans. title], A. Busck and A Dampf (*Mex. Sec. Agr. y Fomento, Ofic. Defensa Agr. [Pub.] 2 (1929), pp. 55, pl. 1, figs. 24*).—Part 1 of this account consists of a technical description of the adult of this lepidopterous stalk borer, by Busck (pp. 5–13, Eng. trans. pp. 11–13), and part 2, of technical descriptions of the larva and pupa and general observations on its biology, by Dampf (pp. 15–51).

Note on the life-history of the fig-tree moth, Ocnerogyia amanda Staud. (Lymantriidae), H. Scott (*Bul. Ent. Research, 20 (1929), No. 1, pp. 39, 40*).—Miscellaneous data based on observations at the entomological laboratory of the Agricultural Institute at Rustam near Baghdad are presented which supplement information by Buxton previously published (E. S. R., 46, p. 559).

Transmission of dengue fever by Aëdes albopictus Skuse, J. S. Simmons, J H. St. John, and F. H. K. Reynolds (*Philippine Jour. Sci., 41 (1930), No. 2, pp. 215–231, pl. 1, fig. 1*).—Experiments are here presented which show that *A. albopictus*, like *A. aegypti* (the yellow-fever mosquito) a common mosquito in Manila, is an effective dengue carrier. Of seven human volunteers bitten by 1, 2, 3, 8, 10, 12, and 22 individuals, respectively, of *A. albopictus*, they having been infected 13 and 22 days previously, all developed dengue fever.

Dengue fever transmitted by Aedes albopictus Skuse, J. S. Simmons, J. H. St. John, and F. H. K. Reynolds (*Amer. Jour. Trop. Med., 10 (1930), No. 1, pp. 17–21*).—Noted above.

Effect of chemicals upon the behavior of mosquitoes, W. Rudolfs (*New Jersey Stas. Bul. 496 (1930), pp. 24, fig. 1*).—Following a review of the literature, the author reports at length, largely in tabular form, on tests made of the reaction of mosquitoes to various materials based upon work conducted during four consecutive summers with comparatively large numbers of *Aedes sollicitans*, *A. cantator*, *A. canadensis*, *A. sylvestris*, and *Culex pipiens*. Observations on changes in weather and the behavior of mosquitoes, a comparison of possible numbers alighting with protection time, the repellent action of volatile substances on house and woodland mosquitoes, the reaction of mosquitoes to volatile substances apparently not affecting their physical condition, and the effect of volatile substances upon the physical condition of mosquitoes (nervous convulsions and autotomy) are reported upon.

The experiments and observations show that different chemicals cause a marked difference in the reactions of the mosquitoes. "The reactions could be divided into two general groups; namely, that in which the effect resulted in violent activation, and that in which the chemical apparently acted as a drug. For protection of the individual against mosquito bite, the former groups seemed to be of greatest importance. The protection of man is due either to obscuring attractive agents or to direct repulsion of mosquitoes by the chemical used for protection. The effect of a number of substances tried was such that the violent motions resulted in true autotomy. Such substances, as a rule, had the greatest repelling power and lasted longest."

Studies on transmission of experimental yellow fever by mosquitoes other than Aëdes, C. B. Philip (*Amer. Jour. Trop. Med., 10 (1930), No. 1, pp. 1–16*).—"Experiments with *Taeniorhynchus (Mansonioides) africanus* Theo.

showed that this species is capable of acting in the capacity of insect host for the yellow fever virus. Transmission to monkeys was accomplished in ten instances with eight fatalities, both by the bites of mosquitoes and by the injection of their ground-up bodies. Five of the deaths resulted from the inoculation of ground-up insects, and three from infection by bites. A recovery also occurred after each method of exposure. One insect was sufficient to cause typical fatal infection. Similar experiments with *Anopheles gambiae* Giles (=*costalis* Lw.) failed to produce infection in test animals through bites or by injection of the ground-up insects after a period equivalent to that required by *A*[*edes*] *aegypti* to become infective by bite."

Transmission of dengue virus from infected to normal Aedes aegypti, J. H. St. John, J. S. Simmons, and F. H. K. Reynolds (*Amer. Jour. Trop. Med., 10* (*1930*), *No. 1, pp. 23, 24*).—It was found possible to infect normal yellow-fever mosquitoes with dengue by feeding them through a guinea pig skin on a mixture of blood and macerated dengue-infected mosquitoes. Mosquitoes fed on this mixture later produced dengue fever in two human volunteers. It is thought that this method should prove helpful in the study not only of dengue but also of other virus diseases transmitted by insects.

Transmission of the virus of dengue fever from mosquito to mosquito, J. H. St. John, J. S. Simmons, and F. H. K. Reynolds (*Philippine Jour. Sci., 41* (*1930*), *No. 3, pp. 381–385, pl. 1, figs. 2*).—Noted above.

Description of the first-stage larva of Gastrophilus inermis Brauer: The gastrophile myiasis of the cheek of the horse [trans. title], G. Dinulescu (*Ann. Parasitol. Humaine et Compar., 7* (*1929*), *No. 5, pp. 419–429, pls. 3, figs. 7*).—A description is given for the first time of the first-stage larva of *G. inermis* and its development, it having been found in horses received from the rural districts of France. Hatching from the egg attached to hair of the cheek of the horse, it burrows beneath the skin of the cheek and into the mucous membrane of the mouth, where it remains until the first molt.

An annotated list of the Tachinidae of Mississippi, H. W. Allen (*Ann. Ent. Soc. Amer., 22* (*1929*), *No. 4, pp. 676–690, fig. 1*).—This account includes a tabular list of the feeding habits of the adults in addition to a list of 126 forms known to occur in Mississippi.

Further observations on the anatomy and function of the proboscis of the blow-fly, Calliphora erythrocephala L., G. S. Graham-Smith (*Parasitology, 22* (*1930*), *No. 1, pp. 47–114, pls. 4, figs. 36*).—A detailed description is here given of the anatomy of the proboscis of the blowfly *C. erythrocephala* and of the functions of the structures found in it.

Observations on some parasites of Oscinella frit Linn.—Part I, A. D. Imms (*Parasitology, 22* (*1930*), *No. 1, pp. 11–36, figs. 14*).—The frit fly is known to be attacked in England by at least two hymenopterous parasites of considerable importance, namely, *Haltiooptera fuscicornis* Walk. and *Rhoptromeris eucera* Htg. It is also parasitized to a much lesser degree by *Loxotropa tritoma* Thoms. In the Harpenden district a parasitism of 27 per cent was observed in 1926 and of 37 per cent in 1927, *R. eucera* being the dominant parasite.

"Evidence is brought forward which appears to indicate that the parasites, collectively, become more abundant as the season advances, with the result that *O. frit* affecting late sown oats suffers markedly heavier parasitization than when it attacks oats drilled earlier in the season. The time of maximum emergence of *O. frit* in out-of-door rearing cages during the years 1926 and 1927 coincided very closely with its period of greatest abundance in the field, as recorded by Cunliffe [E. S. R., 61, p. 554]."

On the injury caused by the pine sawyer (Monochamus sutor L.) and its prevention [trans. title], I. Trägårdh (*Meddel. Statens Skogsförsöksanst.*

[*Sweden*], *No. 25* (*1929*), *pp. 171–228, figs. 29; Eng. abs., pp. 219–228*).—The author deals with the oviposition, larval tunnels, and pupal chambers of the pine sawyer, the emergence of the adult beetle, the feeding habits of the adults, oviposition, the time the larva penetrates into the wood, distance of larval penetration during the autumn, conditions favoring its occurrence and damage to timber, possibility of its spreading to other countries and becoming established there, detection of its presence, and description of the larva.

The bionomics of Lema melanopa L. (Criocerinae) in Great Britain, W. E. H. Hodson (*Bul. Ent. Research, 20* (*1929*), *No. 1, pp. 5–14, pls. 2*).—A report is given of studies of a serious pest of cereal crops in certain regions of Europe which is becoming of increasing importance on cereals in Great Britain.

"The adult beetles emerge from hibernation in April, mate, and commence to oviposit toward the end of May. Oviposition continues for nearly two months, and adults commence to emerge early in July and continue to do so until September. There is no indication that a second brood occurs, although the climate would permit of one. The adults feed freely after emergence, but largely on grasses prior to hibernating in November. In the spring they feed almost exclusively on the leaves of young cereals. The larvae feed principally on cereals. Adults tend to be gregarious and are very long lived, numbers living over a second winter."

Two larval parasites have been found in Great Britain, 25 per cent of the larvae collected in the field being parasitized. It is pointed out that the loss of crop sustained as a result of attack by this pest in Europe in extreme cases reaches as high as 50 per cent of the total. Control measures consist of cultural methods, spraying, and dusting.

Observations on the biology of some flea-beetles of economic importance, H. C. F. Newton (*Jour. Southeast. Agr. Col., Wye, Kent, No. 26* (*1929*), *pp. 145–164, figs. 27*).—The species here studied include the belladonna flea beetle (*Epitrix atropae* Foudras), the brassy tooth-legged flea beetle (*Plectroscelis* (*Chaetocnema concinna* Marsh)), *C. aridella* Payk., the hop flea beetle (*Psylliodes attenuata* Koch), the potato flea beetle (*P. affinis* Payk.), and the cabbage stem flea beetle (*P. chrysocephala* L.).

New Curculionidae (Col.) from cacao and camphor, G. A. K. Marshall (*Bul. Ent. Research, 20* (*1929*), *No. 2, pp. 201–204, figs. 2*).—Descriptions are given of four new species, two from Bahia, Brazil; one from the island of Fernando Po, Spanish Guinea; and one from Buitenzorg, Java.

Apiary inspection, 1927–1929, and the foulbrood law, F. L. Thomas and C. E. Heard (*Texas Sta. Circ. 55* (*1930*), *pp. 15*).—During the year 1927–28 inspections were made in 59 counties in Texas, in which 34,671 colonies were examined. These were distributed among 511 beekeepers, American foulbrood being found in 1.5 per cent of the total number of colonies, occurring in the apiaries of 103 beekeepers. In 1928–29 the inspection work was confined almost entirely to queen breeders and package bee shippers. The text of the Texas foulbrood law and regulations are appended.

On the causes of swarming in the honey bee (Apis mellifera L.): An examination of the brood food theory, D. M. T. Morland (*Ann. Appl. Biol., 17* (*1930*), *No. 1, pp. 137–149, figs. 3*).—In this contribution from the Rothamsted Experimental Station the influence of nitrogenous food in the hive is considered in its bearing on the question of swarming, and the theories of the origin of the brood food are examined. The division of labor among the bees of various ages is considered in its relation to the brood rearing cycle. A critical surplus of nurse bees is found to be associated with the formation of queen cells in preparation for swarming. Recognized swarm control measures are reviewed in the light of the brood food theory.

A list of 31 references to the literature is included.

A contribution to the knowledge of the life history of Bremus bimaculatus (Cresson) (Hym.), T. H. FRISON (*Ent. Amer., n. ser., 8 (1928), No. 4, pp. 159–222, pls. 4*).—The results of a study of various aspects of the biology of the bumblebee *B. bimaculatus*, based upon observations of nests of this species established under both natural and control conditions, are here reported. This being the first of a series of contributions on the biology of the various species of bumblebees, a brief account is given of the methods employed.

A contribution to the knowledge of the bionomics of Bremus impatiens (Cresson) (Hymenoptera), T. H. FRISON (*Bul. Brooklyn Ent. Soc., 24 (1929), No. 5, pp. 261–285, figs. 7*).—This is the second (see above) of a series of papers dealing with the biology of the North American species of bumblebees.

[Fourth and fifth contributions on the ichneumonid fauna of Japan], T. UCHIDA (*Jour. Faculty Agr., Hokkaido Imp. Univ., 25 (1930), No. 4, pp. 243–347, pls. 3, fig. 1*).—In continuation of the studies of the Ichneumonidae of Japan (E. S. R., 60, p. 847), part 4 (pp. 243–298) deals with the subfamily Tryphoninae in Japan, Sachalin, Korea (Chosen), and Formosa (Taiwan), including 3 new genera, 40 new species, and 6 new varieties. Part 5 (pp. 299–347) deals with the subfamily Cryptinae, including a new genus, 51 new species, and 10 new varieties.

A contribution on the ichneumonid fauna of Japan [trans. title], T. UCHIDA (*Jour. Faculty Agr., Hokkaido Imp. Univ., 25 (1930), No. 4, pp. 349–376, figs. 4*).—This account, supplementing those above noted, includes a host list of the Ichneumonidae of Japan, a discussion of the external anatomy, etc.

Borer control by the egg parasite, Trichogramma minutum, W. E. HINDS and H. SPENCER (*Sugar Bul., 8 (1930), No. 7, pp. 6–8*).—This is a contribution from the Louisiana Experiment Stations in which the results of field colonization of *T. minutum* near Baton Rouge, La., in 1929 are reported. This is considered to have been a clear-cut demonstration of the possibility of controlling the borer quite effectively by field colonization of some 22,000 parasites per acre during the period that the eggs for the second generation of borers are laid.

New species and host records of Braconidae, D. S. WILKINSON (*Bul. Ent. Research, 20 (1929), No. 2, pp. 205–208, fig. 1*).—The three species here described as new include *Rhaconotus oryzae*, an egg parasite of the pyralid rice borer *Schoenobius incertellus* Walk., known to hibernate in rice stubble, and *Dinocampus mylloceri*, reared from *Myllocerus maculosus* Desb., a weevil pest of cotton.

On methods of counting nematode ova in sheep dung, N. R. STOLL (*Parasitology, 22 (1930), No. 1, pp. 116–136, pl. 1, fig. 1*).—A detailed account is given of adaptations of dilution egg counting and direct centrifugal flotation for use on sheep feces for the ova of *Haemonchus contortus*, together with certain data on their comparative efficiency.

ANIMAL PRODUCTION

Tame versus native pastures, 1929, O. S. WILLHAM (*[Oklahoma] Panhandle Sta., Panhandle Bul. 15 (1930), pp. 3–7*).—Continuing this study (E. S. R., 61, p. 66), the same native and Sudan grass pastures were used. A sweetclover plat was also planted for this trial but did not get enough start to be of much value as a pasture. Two yearling Holstein heifers were placed on each plat on June 15, but by the middle of July the sweetclover was so short the heifers had to be removed. A mature cow was turned in with the heifers on Sudan grass on August 1 because of the rank growth and allowed to remain until August 21.

The native grass plat produced 11.33 lbs. of gain per acre, while the Sudan grass produced 69 lbs. of gain per acre. The 2 years' results indicate that Sudan grass is a good succulent pasture during July, August, and September and makes an excellent supplement to scant pasture during the latter part of the summer. The Sudan grass pasture seemed to respond better to a medium dry season than to a wet season when compared with native pasture. The native grass had a longer pasture season than the Sudan grass but only about one-third the carrying capacity, and the latter grass produced about 11 times as much gain per acre. A large part of the gain produced on native pasture was lost when it was used for too long a period in the fall.

The use of alfalfa pasture for fattening cattle, W. P. Snyder (*Nebraska Sta. Bul. 239* (*1930*), *pp. 12*).—To determine the value of alfalfa pasture for cattle on a full feed of shelled corn, a lot of 9 yearling heifers were run on alfalfa pasture from June 11 to October 9, a period of 120 days. At this time pasture was no longer available, and the animals were fed corn and alfalfa hay in dry lot for 20 days. A similar lot of 10 heifers were fed corn and alfalfa hay in dry lot for 140 days. Both lots had been on a preliminary feed and had been brought up to a full feed of corn before the experiment started, and weighed approximately 400 lbs. per head at that time.

Up to September 3 the heifers on pasture had gained 38 lbs. more per head than those in dry lot, but between this date and October 9 they lost 15 lbs. and by the end of the 140 days had gained 20 lbs. more per head for the entire period than the dry-lot animals. About the same degree of finish had been attained in both lots by the end of the test.

Feeding on pasture reduced the corn required per 100 lbs. of gain 55 lbs., and the cost of 100 lbs. of gain $1.08 after $2.50 per head was allowed for pasture. It was estimated that each animal consumed an equivalent of 1,000 lbs. of alfalfa, dry weight, while on pasture. When both the preliminary and experimental periods are considered, the heifers on pasture returned a profit of approximately $4 more per head than those fed in dry lot.

Normal growth of range cattle, J. L. Lush, J. M. Jones, W. H. Dameron, and O. L. Carpenter (*Texas Sta. Bul. 409* (*1930*), *pp. 34*, *figs. 14*).—The data in this bulletin are based on the weights taken eight times each year from birth to about 30 months of age of more than 500 steers and heifers born at the Ranch Experiment Station from 1921 to 1929, inclusive. The animals represented three kinds of breeding, high-grade Herefords, first-cross Brahman-Herefords, and back crosses of the first-cross heifers to Hereford bulls. Linear measurements were taken four or more times on five different groups of Herefords born from 1921 to 1925. The animals studied were on range all of the year, and during the eight winters it was only necessary to give them supplemental feed in two winters and for shorter periods in three other winters. The term "normal" growth is used in this publication to indicate the usual growth obtained under conditions existing at the Rranch Experiment Station.

The weight increase of the animals was rapid from the middle of April to the middle of July. During some years the weight increased until early December, but usually slowed down from late summer to early winter. There was an actual weight loss from the middle of January to early March, which was barely recovered by the middle of April. The variations in weight increase were directly related to variations in weather and pasture conditions. Increases in body growth which were affected by the degree of fatness increased rapidly from March to September and slowly from September to March, and the same was true of measurements of body circumference. Measurements of the head and the length of long bones increased at about a normal rate regardless of variations in weather and pasture conditions. Measurements of other parts for skeletal growth were intermediate, but the results indicated that growth was slowed down in parts of the body during periods of scanty feed. The results do not, however, indicate that there was any permanent stunting due to periods of feed shortage.

The steers in this study were slightly heavier than the heifers, and quarter-blood Brahmans somewhat heavier than half-blood Brahmans or high-grade Herefords. However, the breed and sex differences were relatively unimportant as compared with differences due to pasture conditions. Because of the manner in which range cattle put on weight, the surplus cattle are usually marketed in the fall or early winter. This method of marketing protects the range from overgrazing during the winter and early spring. Spring marketing of surplus cattle requires a higher price per pound or a relatively cheap supply of home-gown supplemental feed if the practice is to be as profitable as fall marketing.

Market classes and grades of dressed veal and calf carcasses, W. C. Davis and C. M. Harris (*U. S. Dept. Agr. Circ. 103* (*1930*), *pp. 32, pls. 18, fig. 1*).—This publication contains descriptions and explanations of the market classes and grades of dressed veal and calf carcasses, the basis for the gradings, schedules for the two types of carcasses, and the wholesale cuts, and a short note on kosher veal.

Studies of wool growth (*Washington Col. Sta. Bul. 237* (*1929*), *pp. 19, 20*).—H. Hackedorn and J. Sotola in cooperation with the Bureau of Animal Industry, U. S. D. A., have made a study of the rate of growth of the wool of Rambouillet sheep. The results of 4 years' work have shown no marked variation in the average length growth of staple of wethers shorn in the usual manner and those carrying a 4-years' fleece. The fleece of a wether unshorn for 4 years weighed 62 lbs. and averaged 10 in. in length. The gains in body weight were quite uniform in the two groups, considering the fleece the unshorn wethers carried. There was little difference in the length of staple grown in winter and in summer, nor was there any significant difference in the length of staple grown the first and fourth years. Little difference was found in the length growth of wool of two lots of ewes, one of which was bred and one allowed to go dry.

Cottonseed meal as a feed for hogs, F. Hale (*Texas Sta. Bul. 410* (*1930*), *pp. 32, figs. 10*).—On the basis of the results obtained in this series of studies (E. S. R., 62, p. 660), a ration containing not over 9 per cent of cottonseed meal may be fed to fattening or breeding hogs without any harmful effects. Over a 3-year period 3 sows fed cottonseed meal farrowed 17 litters that averaged 9.49 pigs per litter, while during the same period sows fed tankage farrowed an average of 10.82 pigs per litter. The average birth weights of the pigs in the respective litters were 2.75 and 2.74 lbs. per head. Two gilts out of sows fed cottonseed meal farrowed three consecutive litters averaging 10.5 pigs per litter.

On a ration containing 9 per cent of cottonseed meal pigs gained an average of 0.23 lb. less per head daily than those receiving straight tankage, but when fed minerals in addition to the cottonseed meal made larger gains and required less feed per pound of gain than the check lot. In a ration of milo, cottonseed meal, and tankage 87 : 9 : 4, 36 lbs. of cottonseed meal replaced 6 lbs. of grain and 23 lbs. of tankage for each 100 lbs. of gain produced on 60-lb. pigs fed in dry lot for 120 days as compared with a check ration of milo and tankage

90 : 10. Pigs fed raw cottonseed scoured badly and died. Self-feeding free choice was not a safe method of feeding cottonseed meal, but a mixture of equal parts of cottonseed meal and tankage self-fed produced better results than tankage alone. When milo chop was fed, pigs receiving the mixed supplement gained an average of 0.095 lb. more per head daily than pigs receiving tankage alone.

Can seed wheat treated with copper carbonate be used as a hog feed? H. G. McDonald (*Washington Col. Sta. Bul. 237* (*1929*), *p. 20*).—Continuing this study (E. S. R., 60, p. 858), 2 lots of 7 pigs each were fed for 60 days. One lot received whole wheat and the other lot treated whole wheat that had been washed twice by decantation before feeding. The wheat for both lots was soaked for 12 hours before feeding. A protein supplement of tankage, linseed meal, and alfalfa meal 50 : 25 : 25 and a mineral mixture were fed to both lots. The lot on untreated wheat made an average gain of 95.4 lbs. per head and required 394 lbs. of feed to produce 100 lbs. of gain. The lot receiving treated wheat gained 105 lbs. per head and consumed 368 lbs. of feed per 100 lbs. of gain.

[Experiments with poultry at the Washington Station] (*Washington Col. Sta. Bul. 237* (*1929*), *pp. 41–43*).—The results of experiments, most of which have been continued (E. S. R., 60, p. 859), are noted.

Breeding and selection.—In this study by J. S. Carver and M. W. Miller, 319 White Leghorn hens, 95 White Leghorn pullets, 113 Rhode Island Red hens, and 98 Rhode Island Red pullets were weighed individually and head and body measurements taken. The egg production ranged from 101 to 325 eggs for the White Leghorns and from 101 to 300 for the Rhode Island Reds.

A correlation of 12,121 individual measurements brought out the following points: "(1) There was a distinct relation and correlation between the various measurements taken and body weight; (2) anatomical characteristics are not related to annual egg production; (3) the relationship between the head measurements taken and production indicate that the head point culling, when used alone, can not be used as a basis of present, past, or future egg production; (4) the practice of estimating or judging the past, present, and future production of a bird by anatomical structure alone is not justifiable in the light of present knowledge on this subject; (5) there seems to be no distinct egg type; (6) past production can not be predicted by actual measurement of the anatomical characters when the birds are in laying condition; and (7) it is not possible to estimate future production by anatomical measurements made at the beginning of the laying year."

The value of various proteins and combinations of them for laying pullets.—L. W. Cassel found that supplementing a basal mash with 8 lbs. of liquid skim milk to 20 birds per day produced a higher average number of eggs per pullet, a higher average value of eggs, a lower feed cost per dozen eggs, and a greater return over feed cost per pullet than dry milk powder, meat meal, soybean meal, or a combination of them. Alfalfa hay, chopped in 1-in. lengths, proved to be an excellent substitute for green feed, and when kept before birds at all times they consumed an average of 8 lbs. per head per year.

Protein requirements for growing chicks.—Carver and Cassel found that as the amount of dry skim milk in the ration was increased better growth was obtained. The amount of protein retained by chicks and available for use in growth decreased with the age of the chicks. Chicks 12 weeks of age were able to gain only about one-half as much per gram of feed as day-old chicks. At 5 different levels of milk protein feeding the percentage of protein retained and the protein efficiency was about the same, but the feed efficiency increased as the protein levels increased.

Rate of growth in Rhode Island Reds, F. A. Hays and R. Sanborn (*Massachusetts Sta. Bul. 259 (1929), pp. 303–321*).—The records upon which this study was based cover a period from 1918 to 1928, inclusive. Hatching dates remained constant throughout, and the methods of feeding and management were the same. Records were kept of individual weights of chicks at hatching and at 2, 4, 16, and 21 weeks of age. The chicks were not fasted before weighing at 2 weeks of age, but with all later weighings the birds were fasted for 12 hours. Information is also given on the relation of egg weight to weight of birds at different ages, on the relation of hatching date and age of mother to weight of birds, and the importance of early growth as a criterion of vigor and later egg production.

The records show that the normal weights of Rhode Island Red chicks are 36.7 gm. at hatching, 87.9 gm. at 2 weeks, 214.1 gm. at 4 weeks, 1,390 gm. at 16 weeks, and 2,126.9 gm. (4.69 lbs.) at 21 weeks. At hatching time the weight of chicks varied from 33 gm. for chicks from small egg dams to 38.7 gm. for large egg dams. At 4 weeks of age there was still a difference of 26.9 per cent in favor of the chicks from large egg dams, but at 21 weeks the weight differences had disappeared. Early hatched chicks were 12.98 per cent heavier than late hatched chicks at 2 weeks of age, 28.79 per cent heavier at 4 weeks, 21.7 per cent heavier at 16 weeks, and 17.12 per cent heavier at 21 weeks, even though the mean difference in hatching weight of early and late hatched chicks was not large.

Chicks from hen mothers were 5.01 per cent heavier than those from pullet mothers at hatching time, 8.62 per cent heavier at 4 weeks, and 6.97 per cent heavier at 16 weeks, but at 21 weeks of age there was no significant difference. The mean weight of hatching eggs from hen mothers was 59.56 gm. and from pullet mothers 56.19 gm. In these studies the chicks averaged 61 per cent of the weight of the eggs from which they were hatched.

The pullets that weighed less than 0.5 lb. at 4 weeks of age were slightly less vigorous than those weighing more than 0.5 lb. at this age, but no difference in vigor was observed in pullets weighing less than 4.5 lbs. and those weighing more than 4.5 lbs. at 21 weeks of age. It was found that heavy weight at 4 or 21 weeks of age was no criterion of egg production during the pullet year.

The relationship between the number and weight of eggs and body weight of Leghorn fowls during the first three years of production, H. Atwood and T. B. Clark (*West Virginia Sta. Bul. 233 (1930), pp. 19, fig. 1*).—Concluding this study (E. S. R., 60, p. 469), the influence of senescence was found to decrease egg production from the first to the second year 20 per cent and from the second to the third year 22 per cent. The average weight per egg incerased 6.8 per cent from the first to the second year, but there was no significant change in weight from the second to the third year. The average weight of eggs laid per bird during the third year was 6,008 gm., a decrease of 22.2 per cent from the weight for the second year. Maximum intensity of egg production occurred in April and May, and minimum intensity in November and December.

Correlations for the different years in the number of eggs laid per year were significant in all cases, showing that birds that were good layers the first year would probably be good layers in later years. However, since the coefficients were not high they showed that various factors influenced the number of eggs laid from year to year. Correlations in mean annual egg weights for the different years were highly significant, showing that the weight of eggs laid by a bird is a stable character which persists from year to year. The correlations between body weight and egg weight were in all cases significant, showing that the heavier birds laid the heavier eggs.

The average weight per bird for the third year was 4.25 lbs., an increase of 6.52 per cent over the second year's weight. During the second and third years the birds usually were heaviest in March and April and lightest in November and December. While the body weight of birds became more variable with increased age, there was no evidence to show that the birds which became materially heavier were either better or poorer layers than those that maintained their body weight.

Culling of small pullets in the fall usually increased the size of eggs laid by a flock. No relationship existed between the number of eggs laid by a bird and the mean weight of the eggs, nor was any relationship found between mean body weight and the number of eggs laid. With pullets it was found that the younger the bird at first egg the better was the annual egg production, but this relationship did not exist during later years.

Inbreeding in relation to egg production, F. A. Hays (*Massachusetts Sta. Bul. 258 (1929), pp. 255–302, figs. 10*).—To study the effects of different degrees of inbreeding upon characteristics affecting egg production in Rhode Island Reds and the effects of heterosis on fecundity traits, an analysis was made of the records of hens during the period from 1923 to 1929. The various groups of birds used in this study included a group of intensely inbred hens mated to an outside male of "Standard" breeding to study heterosis, 4 groups beginning with different degrees of inbreeding and the inbred lines crossed during the last 3 years, and 3 check groups of varying degrees of heterosis inbred the last 3 years. Inbreeding data are presented on mother and offspring for a period of 6 years, the foundation females in this group consisting of one hen and her daughters, and the males used were related to these females.

It was observed that the only desirable effect of heterosis from the standpoint of fecundity was greater body weight. Inbreeding the check groups the last 3 years gave better results than those obtained with the original inbreds during the first 3 years, indicating that birds of diverse ancestry may be closely bred with greater safety than those of a restricted ancestry. Sexual maturity was not consistently or regularly retarded by inbreeding, nor was body weight at first egg affected. Winter pause, low intensity, and low persistency probably accompanied the practice of inbreeding. Inbreeding tended to lower production, decrease fertility, lower the sex ratio, reduce chick and first year laying vigor, and probably decrease hatchability.

In the inbred groups from restricted ancestry the uniformity in characteristics affecting fecundity was not influenced markedly by inbreeding, but in the check lots these characters became more uniform with inbreeding. Crossing inbred strains produced progeny superior to the second and third generation progeny of inbreeding, but not equal to the foundation stock. The practice of inbreeding intensified the inherent weaknesses of the foundation stock, showing definitely the necessity for strict selection of such stock for inbreeding purposes. No advantages were shown in these studies of inbreeding over the ordinary method of flock improvement, consisting of rigid selection for characteristics affecting fecundity when close matings are avoided. The author believes that more satisfactory progress may be made in improving the flock by selection on the unit factor basis rather than on the individual bird basis as is the practice in inbreeding.

Egg production for profit, L. M. Black (*New Jersey Stas. Hints to Poultrymen, 18 (1930), No. 4, pp. 4*).—The economy of production and the efficient operation of the poultry plant in relation to the profitableness of egg production are discussed in this publication.

Effect of variations in prices of eggs and feed upon farm income, W. F. Knowles (*New Jersey Stas. Hints to Poultrymen, 18 (1930), No. 5, pp. 4*).—The price received by New Jersey poultry farmers per dozen eggs per month from 1923 to 1928 and the feed cost per bird and per dozen eggs for this period are presented in this publication to show the effect of variations in the price of eggs and feed upon farm income. The expected income from a flock of 500 White Leghorn hens and 1,000 pullets during the low year and the high year and under average conditions is also shown.

Cod-liver meal proves superior to cod-liver oil (*New Hampshire Sta. Bul. 250 (1930), pp. 14, 15*).—Continuing the comparison of cod-liver meal and cod-liver oil (E. S. R., 59, p. 771), H. O. Stuart and T. B. Charles found that a lot of 75 chicks receiving 2 per cent of cod-liver meal weighed an average of 19.11 oz. each at 7 weeks of age. This was approximately 2 oz. more than a similar lot fed 1 per cent of cod-liver oil. A lot fed 2 per cent of cod-liver oil averaged 15.82 oz., those receiving 3 per cent of oil 13.81 oz., and those receiving 4 per cent of oil 15 oz. Excessive feeding of cod-liver oil resulted in slow and uneven growth, and pale shanks were characteristic of chicks so fed. In this test the chicks receiving the cod-liver meal consumed 78.14 oz. of feed per chick, those receiving 1 per cent of cod-liver oil 45.75 oz., 2 per cent of oil 42.72 oz., 3 per cent of oil 45.42 oz., and those on 4 per cent of oil 52.07 oz.

The hatchability of eggs produced by 150 pullets fed cod-liver meal was 74.6 per cent, as compared with 64.3 per cent for the eggs of pullets fed cod-liver oil. Of the fertile eggs set the hatchability was 84.3 and 75.4 per cent, respectively.

Baby chicks, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 18 (1930), No. 6, pp. 4, fig. 1*).—The value of healthy breeding stock, of the breeding back of baby chicks, and the advantages and disadvantages of the different hatching seasons are discussed in relation to the success of a commercial poultry enterprise.

Managing confined fowls, H. C. Knandel, E. W. Callenbach, and P. H. Margolf (*Pennsylvania Sta. Bul. 246 (1930), pp. 14, figs. 3*).—Concluding this study (E. S. R., 62, p. 367), with data on 5,000 chickens reared in confinement in 1929, it was determined that the eggs of birds raised and maintained in confinement hatched satisfactorily and that the chicks hatched from these eggs made uniformly good growth. The mortality rate of chicks raised in confinement was low. The birds so reared possessed deep yellow pigmentation during the rearing period and at maturity, and their flesh was of excellent table quality.

The confinement system of brooding does not prevent coccidiosis, but no tapeworm or roundworm infestations were observed in the intestines of birds raised by this method. However, a few cases of cecal worms were observed. Less land is required where birds are raised in confinement, but this system of rearing chicks is not advocated except where the range is infested with roundworms or tapeworms. Under some circumstances a modification of the confinement method, using free range part of the year, may be advantageous.

Rabbits, W. C. Thompson (*New Jersey Stas. [Hints to Poultrymen], 18 (1930), No. 7, pp. 4, fig. 1*).—The breeds of rabbits and their particular uses, breeding, feeding, and housing, and the clipping or pelting of rabbits are briefly discussed.

DAIRY FARMING—DAIRYING

Metabolism of milch cows (*New Hampshire Sta. Bul. 250 (1930), p. 21*).—Studies of the insensible perspiration of cows by E. G. Ritzman, in cooperation with F. G. Benedict of the Carnegie Institution of Washington, indicated that the daily loss of weight due to excretion of carbon and water vapor through the lungs and skin acts as a safety valve by which the animal eliminates excess heat under high pressure of metabolism. Daily changes in feed consumption, humidity, and environmental temperature affects the insensible perspiration without changing the milk flow.

The cost of digestion in terms of energy consumed as measured by two Holstein cows, based on the difference in metabolism on full feed and the second day of fast, was 55 per cent of the fasting metabolism of one cow and 60 per cent in case of the other. This difference was due almost entirely to differences in basal requirements.

The use of the self-feeder in wintering dairy heifers, H. O. HENDERSON and E. L. ANTHONY (*West Virginia Sta. Bul. 232 (1930), pp. 20, figs. 10*).—During the winter of 1921–22 and for the two subsequent winters, a group of heifers, yearlings in two tests and 4-months-old heifers in one test, were fed a ration as near to their requirements as practicable, while a similar group received all the roughage they would consume and were given access to a self-feeder filled with corn meal, wheat bran, and linseed oil meal. During the winter the animals were housed in large open sheds and in summer ran on pasture with no additional feed. The first two tests were continued through one winter and a pasture season, while in the last test the heifers remained on experiment until they freshened. Weights of the animals and height at withers were taken at 2-week intervals during the winter and at monthly intervals during the summer.

The self-fed heifers made greater gains during the winter than did the hand-fed heifers, but when turned on pasture the reverse was true. The pasture gains made by the hand-fed heifers tended to offset the gains of the self-fed heifers. Self-fed heifers, especially those self-fed from birth, attained their full growth at an earlier age than the heifers that were hand-fed, but there was practically no difference in the final growth attained in the two groups.

Less roughage, but approximately four times as much grain per pound of gain, was consumed by the self-fed heifers than by the hand-fed heifers. On the average the self-fed heifers consumed approximately 100 per cent more digestible protein and 50 per cent more total digestible nutrients than the hand-fed heifers per pound of gain when no account was taken of the amounts obtained from pasture.

The heifers on the self-feeder were able to select the proper grains so far as health and digestion were concerned, but this method of feeding was very expensive from the standpoint of growth as compared with the heifers fed by hand. The self-fed heifers did not come into milk at an earlier age, nor did they possess any better dairy qualities than those fed by hand.

Feeding dairy cows, T. E. WOODWARD and A. B. NYSTROM (*U. S. Dept. Agr., Farmers' Bul. 1626 (1930), pp. II+18, figs. 2*).—This is a revision of and supersedes Farmers' Bulletin 743 (E. S. R., 35, p. 674).

The results of a five year mineral feeding investigation with dairy cattle, O. E. REED and C. F. HUFFMAN (*Michigan Sta. Tech. Bul. 105 (1930), pp. 63, figs. 98*).—This is a more detailed account of work previously noted (E. S. R., 62, p. 870).

Costs of high plains dairy rations, W. E. Connell (*[Oklahoma] Panhandle Sta., Panhandle Bul. 15 (1930), pp. 8–11*).—This is a discussion of the essentials of a good ration for dairy cows, together with examples of rations that should prove suitable from the standpoint of palatability and economy under Oklahoma Panhandle conditions.

Within the breed the big dairy cows excel, J. C. McDowell (*U. S. Dept. Agr. Circ. 114 (1930), pp. 4*).—A study of the yearly individual records of about 220,000 cows in dairy-herd-improvement associations revealed that in general within the same breed the heavier cows excelled the lighter cows of the same age in milk production and in income above feed cost. The larger animals consumed more feed than the smaller animals, but the increased consumption was not in proportion to the increase in production or in income. On the basis of this study it is concluded that other things being equal a large cow will produce more milk and return a greater profit than a small cow.

A statistical study of the size of fat globules in cows' milk, C. W. Turner and A. C. Haskell (*Missouri Sta. Research Bul. 130 (1929), pp. 11, figs. 5*).—Concluding this study (E. S. R., 62, p. 72), the statistical constants for the arithmetic mean using the volume distribution were determined for each breed as follows: Jerseys 5.06 with a standard deviation of 1.57 μ, Holsteins 4.29 and 1.51 μ, and Ayrshires 4.02 and 1.46 μ. The geometric mean and standard deviation ratio for Jerseys were 4.85 and 1.00 μ, for Holsteins 4.00 and 1.04 μ, and for Ayrshires 3.75 and 1.03 μ. The diameter of the globule of average volume for Jerseys was 4.01 μ, for Holsteins 3.12 μ, and for Ayrshires 3.27 μ.

The authors believe that the geometric mean and standard deviation ratio are more appropriate statistical constants than the arithmetic mean and standard deviation.

Foaming of milk and cream, C. S. Leete (*U. S. Dept. Agr. Circ. 108 (1930), pp. 7, figs. 2*).—The factors butterfat content, temperature, age, agitation, pasteurization, and vacuum were studied to determine their effect on the foaming of milk and cream. A mixture of morning's and the previous evening's milk constituted fresh milk in this study, and skim milk, milk containing 3 and 5 per cent of butterfat, and cream containing 18 per cent of butterfat were used.

The least foam was formed on the skim milk and milk containing 3 and 5 per cent of butterfat at from 20 to 30° C. and on the cream at 40°. At temperatures lower than 20° a large amount of light airy foam was produced on skim milk and milk, while increasing amounts of heavier foam occurred at temperatures of from 30 to 80°. With cream the amount of foam increased as the temperature increased from 40 to 80° or decreased from 40 to 20°. Aging up to 72 hours had little effect on foaming. Agitation caused increased amounts of foam with all milks and cream studied, and the foaming which occurred in vacuo was approximately equal to that under atmospheric pressure. In general the foam produced at low temperatures was unstable, whereas that produced at higher temperatures was quite stable.

Immediate measurements of the quantity of foam on raw skim milk were greater than those on pasteurized skim milk, but the reverse was true when measurements were made 1 minute later. Immediate measurements of raw milks showed more foam than did those of pasteurized milks, but with the 1-minute measurements the reverse was true. The 1-minute measurements were the same for both raw and pasteurized milks aged 24, 48, and 72 hours. For both raw and pasteurized cream the 1-minute measurements were practically the same, but after being held the raw cream formed more foam than the pasteurized cream. Held samples of pasteurized skim milk had a greater volume of foam than similar samples of raw skim milk. The immediate and 1-minute measurements were relatively the same, but the actual measurements were smaller. As the temperature increased the difference between the two measurements lessened.

Experiments in cooling milk (*New Hampshire Sta. Bul. 250 (1930), pp. 11, 12, fig. 1*).—For cooling milk in cans W. T. Ackerman found that refrigerated tanks in which cans are immersed should contain approximately 3 to 5 gal. of water to each gallon of milk. Milk can be precooled by circulating well water at 51° F. through a tubular aerator to as low as 52.5° at a cost of 25 cts. per 100 qt., including storage for one day. Subsequent storage in 40-qt. cans in a wet tank with a 2-in. cork insulation was made at an average expenditure of 2.2 kw. hours per day per 100 qt. of milk during the period from October to June. Storage in dry storage rooms was made at an average cost of 2.02 kw. hours per 100 qt. of milk.

The effect of different pasteurization temperatures on several of the physical properties of milk, W. H. E. Reid (*Missouri Sta. Research Bul. 126 (1929), pp. 12, figs. 7*).—This is a more detailed account of work previously noted (E. S. R., 58, p. 871).

The effect of the temperature of storage of acidophilus milk upon the number of viable organisms (*Washington Col. Sta. Bul. 237 (1929), pp. 25, 26*).—Samples of milk prepared from various *Lactobacillus acidophilus* organisms were examined by L. A. Black to determine the decrease in the number of organisms during storage. It was found that when the acidity was not too high the number of organisms did not decrease rapidly at 48° F. or even at 32°. There was little difference in the decrease at 72° and at 48°.

Factors influencing the flavor of butter (*Arkansas Sta. Bul. 249 (1930), pp. 26*).—The results presented in this publication are the final reports of studies previously noted (E. S. R., 62, p. 872).

I. *The effect of various starter cultures on the flavor of butter*, C. C. Walts.—An analysis of the 9 starter cultures used showed that 5 were not strictly pure cultures of lactic acid bacteria, since 4 of the 5 contained alkali-producing types of bacteria and the fifth contained yeasts. These foreign types of organisms were thought to be due to contamination, either in the manufacturing or in the packaging process. Of the 254 samples of butter scored for flavor, there were no significant differences in the scores of the butters made with the 9 different cultures. Efforts to rank the starters on flavor and aroma alone were unsuccessful. It is concluded that in the hands of an experienced butter maker all of the starter cultures used would be equally effective for improving the flavor of butter made from either partially neutralized or sweet cream.

II. *The effect of various neutralizers on the flavor of butter*, C. C. Walts and M. S. Libbert.—Determined on the basis of 100 per cent for calcium hydrate, the alkalinity values of the 11 neutralizers studied varied widely among the lime and soda neutralizers. Of the lime neutralizers, those containing magnesium were much higher in their neutralizing ability than those containing calcium. Soda neutralizers varied from 1 to 3 minutes in the time required to react with the acids in the cream, calcium lime neutralizers from 4 to 5 minutes, and magnesium lime neutralizers from 10 to 15 minutes. The acidity reduction due to pasteurization varied from 0.04 to 0.06 per cent for soda neutralizers and from 0.01 to 0.04 per cent for lime neutralizers. There were no significant differences in the scores for flavor of butters made with the different neutralizers. The use of a neutralizer improved the score of butter in all cases, and the improvement was more marked in fresh than in storage butter.

The effect of aging the mix on the freezing time, overrun, and quality of ice cream, C. D. Dahle, J. I. Keith, and A. D. McCullough (*Pennsylvania

Sta. Bul. 247 (1930), pp. 20, figs. 6).—Concluding this study (E. S. R., 62, p. 372), it was found that the viscosity of most ice cream mixes increased during aging periods of 4 and 24 hours. There was a slight change in the titrable acidity and H-ion concentration during aging, the mix becoming slightly less acid, and this was particularly true of the H-ion concentration. Increasing the homogenizing pressure from 2,500 to 3,500 lbs. increased the H-ion concentration slightly, and the change was more noticeable in mixes containing 12 per cent of fat than in those containing 10 per cent of fat. The desired overrun was obtained in practically the same time with mixes aged 4 hours as with those aged 24 hours, but the latter mixes produced a somewhat greater overrun. Mixes aged 1 hour or less required a long freezing period to obtain the desired overrun, and the total overrun obtained was less. Pasteurizing at 170° F. for 10 minutes produced the desired overrun in a shorter period than pasteurizing at 150° for 30 minutes. The lower homogenizing pressures produced the desired overrun in a somewhat shorter time than the higher pressures, but a slightly greater overrun was obtained with the higher pressures.

The effect of homogenization at different pressures on the physical properties of an ice cream mixture and the resulting ice cream, W. H. E. Reid and G. R. Skinner (*Missouri Sta. Research Bul. 127 (1929), pp. 24, figs. 9*).—In this study mixes containing 10 per cent of fat, 11 per cent of milk solids-not-fat, and 35 per cent of total solids were used. Each mix was pasteurized at 145° F. for 30 minutes and processed in one of five series of pressures, using either a single or double stage homogenizer. Samples were taken from the unprocessed mix and from each processed mix, cooled to 40°, and used for making daily determinations of viscosity and surface tension and for daily microphotographic studies for a period of 120 hours. The mixes were frozen after aging 24 hours, and additional samples were aged for 9, 24, 48, and 72 hours before freezing. When each mix reached 100 per cent overrun in the freezer samples were taken for scoring, and as the ice cream was drawn from the freezer samples were taken at the first of the draw and after 1, 3, 5, 7, and 10 gal. had been removed.

An increase in pressure on the single stage homogenizer caused a uniform increase in viscosity and surface tension irrespective of the age of the mix after 5 hours, but when the first stage of the homogenizer was held constant and the pressure on the second stage gradually increased there was no definite change in viscosity. When the reverse was true the viscosity decreased slightly, and in either case surface tension was gradually increased. Greatest viscosity was obtained at the higher pressures on the single stage homogenizers, and the introduction of the second stage reduced viscosity. Aging the mix had little effect on surface tension, but viscosity, regardless of pressure, reached a peak after 48 to 72 hours. Clumping of butterfat particles occurred, regardless of the pressure, within 5 hours of homogenization, and the clumping did not differ greatly within mixes of different pressures or ages.

The reduction of viscosity through the use of the double stage homogenizer improved the quality of the ice cream, and aging at all pressures, except extremely high ones, up to 72 hours resulted in greater viscosity and better quality. Agitation in the freezer reduced clumping. It was easier to incorporate air in a homogenized mix than in an unhomogenized mix, and an increase in pressure and length of aging aided this incorporation. An ice cream mix processed at 4,000–1,000 lbs. pressure was found to give the most desirable product. Increasing pressure and decreasing aging gave an ice cream of similar quality and texture to that produced by decreasing pressure and increasing aging. Except in the case of mixes processed at extremely high pressures, aging improved the quality of ice cream, and with increased pressure there was a corresponding increase in smoothness, body resistance, warmth, and closeness of texture.

The effect of processing ice cream mixtures at different pressures when the milk solids not fat content is varied, W. H. E. Reid and E. R. Garrison (*Missouri Sta. Research Bul. 128* (*1929*), *pp. 41, figs. 32*).—Concluding this study (E. S. R., 62, p. 72), it was found that the temperature to which an ice cream mix can be frozen and maintain the desired overrun was determined by the composition of the mix and the pressure at which it had been processed. An increase in the milk solids-not-fat content of a mix lowered the temperature of the ice cream when drawn from the freezer. The lower the temperature to which a mix was frozen, the smoother was the resulting ice cream and the greater was the resistance to summer temperatures. The length of the whipping period was of minor importance in determining smoothness. Variation in overrun during the drawing of ice cream from the freezer was due largely to changes in temperature, and when ice cream was drawn from the freezer on the downward trend of the overrun curve a small change in temperature caused a marked decrease in overrun.

Processing a mix improved the body, texture, and flavor of the resulting ice cream, and mixes of high milk solids-not-fat content required lower processing pressure than those of lower concentration. When the overrun of a mix containing 12 per cent of milk solids-not-fat was increased to 110 per cent, the quality of the ice cream mix was improved.

VETERINARY MEDICINE

The cutaneous vaccine for fowl pox, N. J. Pyle (*Massachusetts Sta. Bul. 257* (*1929*), *pp. 235–254, fig. 1*).—This bulletin presents information on the use and efficiency of the cutaneous vaccine, its reaction on birds of various ages, its curative as well as its preventive effect, a modification of its virus content, the duration of immunity which it produces, and the action of the glycerol content of the diluent on the virus in the vaccine, additional to that given in Technical Bulletin 14, previously noted (E. S. R., 60, p. 78).

"Two flocks containing 2,416 birds were vaccinated cutaneously just before being placed in the winter laying quarters. They remained free of fowl pox throughout the year. Annual outbreaks of the disease had occurred in these flocks for the four previous years. The gradual increase in early egg production was slightly retarded subsequent to the vaccination, beginning on the eighth or ninth day and ending on the twenty-first day after the treatment. The results of the work indicated that it was safe to vaccinate birds cutaneously as they were transferred from the range to laying houses, even though they were in early egg production at the time.

"A slight increase in rectal temperature, averaging less than 1° F., occurred following cutaneous vaccination. The vaccination did not result in a retardation in the gain in weight of 80-day-old and 210-day-old birds. A slight retardation in gain in weight did occur, however, in 68-day-old birds. These results, however, were not considered as evidence against the vaccination of birds of such an age in such a manner.

"The 100-mg. vaccine produced follicular swellings and scab formations comparable to the standard, the 300-mg., and the commercial vaccines on birds of 68 and 80 days of age. Therefore, its use appeared to be indicated on birds of these ages. The use of the standard cutaneous vaccine in a flock that was in the early stages of fowl pox infection and but slightly affected apparently prevented further spread of the infection. The results of inoculations with virulent virus suspensions on the combs of cutaneously immunized birds indicated that the duration of immunity was at least 371 days. The glycerol content of the diluent had a decided inhibitory and disinfectant action on the contaminating organisms in the vaccine. Assuming that it had a relatively similar effect on the filtration virus of the vaccine, the attenuation of the cutaneous vaccine as a result of aging may be thus explained."

[Work with diseases of poultry at the New Hampshire Station] (*New Hampshire Sta. Bul. 250 (1930), pp. 13, 14, 27*).—Brief reference is made to a study of paralysis in poultry by C. L. Martin and F. S. Schlenker, in which cell counts and chemical analyses were made of the blood of 10 paralytic birds and 14 normal fowls and chemical analyses of the bones of 5 normal and 5 paralytic fowls. The phosphorus and calcium contents of the blood of the paralytic birds were only 82 and 59 per cent, respectively, as large as in normal birds. The calcium and phosphorus content of the bones of paralytic and normal birds was the same. The hemoglobin of the blood of paralytic birds was found to be less than normal. Of the leucocytes, the lymphocytes were the most numerous, indicating an infection, and the polymorphonuclears fewer in the blood of paralytic birds.

Groups of birds were fed three rations which differed only in the content and source of cod-liver oil and analyses of the calcium and phosphorus content of the blood were made. There was practically no difference in the phosphorus sample, but the birds fed a ration containing a combination of 1 per cent of cod-liver meal and 1 per cent of cod-liver oil had the highest calcium content in the blood, the group fed 1 per cent of cod-liver meal 10 per cent less, and the group fed 1 per cent of oil 25 per cent less.

In vaccinating poultry against fowl pox by Martin and C. A. Bottorff, 6 flocks containing 15,000 birds were treated by the Johnson stab method (E. S. R., 62, p. 473). The percentage of "takes" by this method was found to be equal to that of any other, the birds could be vaccinated about three times as fast as with the follicle method, only one-third as much vaccine was required as for the follicle method, fewer head lesions were observed, and the vaccine was more easily applied. A report of field and laboratory tests by Gildow and Bottorff referred to has been noted (E. S. R., 62, p. 472).

In testing for pullorum disease 1.5 per cent of the 124,785 birds in 173 flocks was found infected in the year 1928–29 as compared with 2.9 per cent the previous season.

Undulant fever in man and its relationship to abortion disease in cattle and swine, A. F. SCHALK (*North Dakota Sta. Circ. 41 (1930), pp. 11*).—A practical account of undulant fever in man due to the infectious abortion organism.

Bang's disease (bovine infectious abortion) and abortion in other farm livestock, A. F. SCHALK (*North Dakota Sta. Circ. 40 (1930), pp. 31, figs. 5*).—A practical summary of information on infectious abortion, particularly in the bovine, with brief accounts of the disease in swine, horses, and sheep.

[Work in veterinary medicine at the Western Washington Station], J. W. KALKUS and C. E. SAWYER (*Washington Col. Sta. Bul. 237 (1929), pp. 44, 45*).—In control work with infectious abortion of cattle, as outlined in Bulletin 196 (E. S. R., 54, p. 870), in which the agglutination test has been conducted periodically since 1923, every animal negative at the time of the first application of the test remained negative on subsequent tests. Reference is made to experimental intravenous injections of neutral acriflavine for the purpose of destroying abortion organisms in the udder, as outlined in Bulletin 222 (E. S. R., 59, p. 76). A brief account is given of the administration of acriflavine but no conclusions are drawn. Milk from the naturally infected cow was positive for abortion organisms 2 days, 9 days, 6 weeks, 12 months, and 16 months after treatment. A sample of milk from one artificially infected cow was negative for abortion organisms prior to injection of the dye, and 5 samples which were taken after treatment were negative. Another cow produced milk containing abortion organisms 2 days after treatment, and samples which were taken 9 days, 6 weeks, 11 months, and 16 months later were negative. Several samples of milk from one cow were positive as long as 11 months after treatment, and samples of milk from the other three cows were positive 17 months after treatment.

Experimental feeding of oxalic acid to three heifers in an attempt to produce red water or cystic hematuria has been completed. No indication of red water was found when oxalic acid was fed continuously to one for over 2 years and to the other two for over 3 years.

AGRICULTURAL ENGINEERING

The submerged weir as a measuring device, G. N. Cox (*Wis. Univ., Engin. Expt. Sta. Bul. 67 (1928), pp. 153, figs. 41*).—Studies made of submerged weirs are recorded. Results indicate that the flow over sharp crested submerged weirs is dependent upon the three-halves power of the upstream head, and upon the ratio of the downstream head to the upstream. This is expressed by the formula

$$Q=CLH^{1.5}, \text{ where } C=4.3\,[1-(S+0.002)]^{0.25}-0.822.$$

In this formula Q is the discharge in cubic feet per second, C is the coefficient of discharge, L is the length of the weir in feet, H is the upstream head on the weir in feet, and S is the percentage of submergence.

This formula is applicable only when the nappe flows above and does not plunge under the surface. The sharp crested weir does not operate in a satisfactory manner when the nappe plunges under the surface, and it is recommended that it be not used under such conditions. The height of the weir does not affect it but does affect the position at which the downstream head is measured. The distance downstream to the low point is directly proportioned to the height. A correction for the velocity of approach must be made and added to the upstream head before the percentage of submergence or discharge is computed.

It was found that the flow over Ogee submerged weirs can not be obtained from as simple a formula as the sharp crested weirs. The exponent varies for different percentages of submergence. The range of flow with the nappe under is the most stable, and the discharge is independent of the height of the weir for this type of flow. The discharge is not independent of the height of the weir when the nappe is flowing on the surface, more water discharging for similar conditions over the higher weirs. The conditions of flow are not as stable, nor the formulas as satisfactory for the type of flow of nappe over, and the use of the Ogee submerged weir is not recommended for this type of flow. The distance from the weir to the position for measuring the downstream head is directly proportional to the height of the weir. A velocity of approach correction must be made and added to the upstream head before the percentage of submergence or the discharge is computed.

It is concluded that in general the water in the channel above the weir should move with a uniform velocity. Baffles should be used for accomplishing this, and, if space is available, should be placed 30 or 40 ft. upstream from the weir. The channel walls should be vertical and parallel to each other. The channel should continue with uniform section downstream from the weir for a minimum distance of five times the height of the weir. It is felt that for a range of heads between 0.2 and 2.5 ft., the submerged weir will operate and give results within 5 per cent by the use of the recommended formulas, provided the above recommendations concerning arrangement have been followed.

Effect of variations in temperature on the operation of the instantaneous reading atmometer, J. E. CHRISTIANSEN, F. J. VEIHMEYER, and C. V. GIVAN (*Ecology, 11 (1930), No. 1, pp. 161–169, figs. 4*).—Experiments conducted at the California Experiment Station are reported. These showed that rates of evaporation can not be read accurately from the instantaneous reading atmometer unless the temperature of the water in the reservoir is nearly constant, or unless a correction is introduced to care for changes in rates caused by temperature and consequent viscosity variations in the water surrounding the resistance member. The rate of evaporation is directly proportional to the head only for a constant temperature. Flow through the resistance member is directly proportional to the head and inversely proportional to the coefficient of viscosity of the water, and may be expressed by the relation $R=KH/\mu$, in which R is the rate of evaporation in cubic centimeters per hour from the atmometer, H is the head in centimeters, K is a constant for a particular resistance member, and μ is the coefficient of viscosity of the water in centipoises. The constant K must be determined for each resistance member by special tests. A bibliography is included.

[Irrigation investigations at the Washington Irrigation Substation], C. C. WRIGHT (*Washington Col. Sta. Bul. 237 (1929), pp. 52–55*).—Progress data are briefly reported on water measurement, soil moisture, alkali reclamation, and ground-water studies.

Rehabilitation of irrigation districts, W. W. MCLAUGHLIN (*Agr. Engin., 11 (1930), No. 3, pp. 116–118, figs. 4*).—This contribution from the U. S. D. A. Bureau of Public Roads presents some of the principles of rehabilitation of irrigation districts.

Supplemental irrigation on the Atlantic coast, F. E. STAEBNER and G. A. MITCHELL (*Agr. Engin., 11 (1930), No. 3, pp. 101–104, figs. 7*).—In a contribution from the U. S. D. A. Bureau of Public Roads, the status and development of supplemental irrigation on the Atlantic coast are briefly described, special attention being given to surface and subirrigation in Florida, spray irrigation for frost protection in Florida, surface irrigation in Virginia, and spray and sewage irrigation in New Jersey.

Sewage irrigation experiments have shown that sanitary disposal of the sewage can be effected by proper operation of a suitable system, and that it is possible to grow at a profit crops against which no valid objection can be raised from the standpoint of health. It has been found essential to install a type of equipment that will permit the ready distribution of the sewage, transportation of the water in underground pipes directly to the points in the field where the distribution begins being desirable. At those points risers discharge the sewage through suitable openings at ground level so arranged as to come at convenient points on a line across the crop rows. With field corn an opening every fourth row has been found satisfactory. All the irrigating is done by means of furrows, and it has been found that permitting the water to run down every other middle between the corn rows gives satisfactory results.

With such a system a clay loam soil with a slope of from 3 to 7 ft. per 100 ft. will absorb 20,000 gal. of sewage per acre per day for long periods. Uninterrupted disposal on one tract of land is to be avoided, however.

Drouth and its relation to supplemental irrigation, J. C. RUSSEL (*Agr. Engin., 11 (1930), No. 3, pp. 97–99, figs. 3*).—In a contribution from the Nebraska Experiment Station, data are presented on the frequency and nature of drought periods, their effects on crop yields, and on the possibility of minimizing their effects by supplemental irrigation, with particular reference to conditions in the Great Plains region.

Data obtained over a period of 26 years at Holdrege, Nebr., show 65 dry periods averaging 48 days in length. Data on crop yields in relation to drought show that an abundance of moisture preceding a prolonged dry period can very largely mitigate its seriousness. With reference to the corn crop, a definite correlation of yield with effective rainfall up to July 1 is indicated. With reference to wheat, high yields are obtained by high fall rainfall and spring rains in excess of some small value, or by high spring rainfall and fall rains in excess of some small value. Relatively, the fall rains are the more important. No high yield is obtained unless the fall rain is in excess of 3 in.

It is considered reasonable to expect that supplemental water applied in the fall or early spring in quantities of from 0.5 to 1 acre-ft. will increase yields of corn, on the average, fully 20 bu. per acre. Additional water to apply in July in periods of extreme summer dryness should result in large enough yields in dry years to offset any detriment of excessive fall or spring irrigation in case the season later turns out wet.

In practice, it is concluded that supplemental irrigation for wheat will need to be emplyed in the fall before the wheat is seeded. In only rare cases, if at all, is spring moisture excessive, so that fall irrigation would not be detrimental. From 3 to 6 in. of water should be applied each fall to insure an adequate total supply. An average increase of only 6 bu. in yield from this quantity of water would be worth while.

Drainage by pumping from wells, W. W. Weir (*Agr. Engin., 11* (*1930*), *No. 3, pp. 105–109, figs. 7*).—In a contribution from the California Experiment Station, the practice of drainage by pumping developed by the station is briefly described.

Influence of drainage on forest growth, P. C. McGrew (*Agr. Engin., 11* (*1930*), *No. 3, pp. 113–115, figs. 4*).—In a contribution from the U. S. D. A. Bureau of Public Roads and Forest Service, the results are briefly presented of studies conducted in cooperation with the Minnesota Experiment Station and the Departments of Drainage and Waters and Forestry and Fire Prevention of the State of Minnesota.

It was found that swamp trees showed increased growth in all cases following ditching where the water table was lowered. No trees were damaged by overdrainage. Sphagnum peat was the least suitable for forest production in both the undrained and drained conditions. Trees were found to respond to drainage about the same on sedge, woody sedge, and woody peat. Tamarack showed less increase than black spruce or cedar. The conclusion is that the drainage of swamp forest for timber production is economical only when there is a general increase in value of swamp timber, when the value of the stand is above the average due to its convenient location, or when the drainage cost can be held at a very low figure.

Terracing experiments, 1929, H. H. Finnell ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 15* (*1930*), *pp. 11–15, fig. 1*).—Experiments are briefly reported which showed that when the initial moisture supply is great and the seasonal rainfall normal or better, large yields may be expected on both unterraced and terraced lands and the increase obtained from terrace-saved water is relatively smaller.

Further experiments showed that there is apparently some wasteful duplication of effort where terracing and fallowing are practiced simultaneously.

Soil moisture determinations showed that though the terraced summer fallowed field contained approximately 1 in. more of soil water than the unterraced, a considerable portion of the increased amount had penetrated below a depth of 4 ft., which is the usual limit of root development for wheat. It was consequently of no benefit to the crop. Within reach of the crop roots the unterraced field had practically as much moisture as the terraced.

Knotty lumber for boxes, G. E. HECK and I. B. LANPHER (*U. S. Dept. Agr. Circ. 105* (*1930*), *pp. 20, figs. 15*).—This circular presents the results of special tests made at the Forest Products Laboratory to determine the effect of knots in certain box parts, and to show how knotty lumber can be used in boxes without decreasing the serviceability of the container. Recommendations regarding the size and position of knots in the several parts of wooden boxes are given which are based not only on the tests presented but on extensive experience in tests of boxes and other wooden products and on observation of containers in service.

Static bending, impact bending, and compression parallel to the grain tests made to determine the effect of knots on the strength of second-growth northern white pine box lumber showed that the size of the knot or of the knot hole represents the portion of the width of the board rendered ineffective in resisting cross-breaking stress. It was found that the shock-resisting capacity of the board is reduced by a knot to a greater extent than is the resistance to cross-breaking stress, and that the stiffness of the board is less affected by knots than is the cross-breaking strength. It was also found that the shape of the knot, that is, whether round, oval, or spike, and whether it is intergrown or incased are not important factors in the strength of the board, and that the position of the knot is of no great importance, provided it does not occur in the nailing edge.

It was found that knots reduce the cross-breaking strength of a board. However, if the sides, tops, and bottoms of boxes are of sufficient thickness to resist shearing at the nails, knotty boards may be used without causing cross-breaking failures. If the knots are large enough the cross-breaking strength of the box board is reduced below the strength of the nailing. Failures by breaking across grain then predominate, and the amount of rough handling the box will withstand is less on the average than if the full strength of the nailing is utilized. Ordinarily, it is preferable to have nail failures in a box rather than to have the box boards break across grain. Knots large enough to consistently cause cross-breaking failures should, therefore, be avoided. With knot diameters of about one-fourth the width of the boards there were very few failures as a result of the boards cross breaking at the knots in either the boxes of 4 or 5 nailed construction. With knot diameters of one-third the width of the boards, more than one-half of the boxes of 4 nailed construction with ⅜-in. (thin) sides, tops, and bottoms failed by cross breaking at the knots, and in the boxes with ½-in. (thin) sides, tops, and bottoms failures at the nails predominated. It appeared advisable to limit knot diameters to about one-fourth the width of boards that have slenderness ratios greater than 60.

The tests showed that knots of equal size have equal influence on the strength of the box regardless of the shape of the knots, that is, whether they are round, oval, or spike.

The test results showed little difference in the relative effect of intergrown and incased knots or of knot holes on the strength of boxes.

Metal bindings were found to modify the effect of knots on the strength and serviceability of boxes in a favorable manner.

Preventing cracks in new wood floors, L. V. Teesdale (*U. S. Dept. Agr. Leaflet 56 (1930), pp. 5, figs. 3*).—Practical information and suggestions are given on the subject.

The static and fatigue properties of some cast irons, J. B. Kommers (*Amer. Soc. Testing Materials Proc., 28 (1928), pt. 2, pp. 174–197, figs. 15*).—This paper reports the results obtained in the testing of ten series of cast iron at the University of Wisconsin. The tests included tension tests on two different sizes of specimens, and compression, impact, transverse, hardness, and fatigue tests. Special attention is drawn to the effects of nickel and chromium additions.

The results showed that while the fatigue endurance limits of cast irons may be roughly estimated from properties such as tensile strength, hardness, modulus of rupture, and the like, the knowledge of the effect of available factors in influencing the properties is so meager that such approximate estimates of endurance limit should always be checked by direct experiment. No consistent relation was found between endurance limit and chemical composition.

Physical and mechanical properties of Portland cements and concretes, W. K. Hatt and R. E. Mills (*Purdue Univ., Engin. Expt. Sta. Bul. 34 (1928), pp. 99, figs. 44*).—This bulletin reports the results of investigations, conducted in cooperation with the U. S. D. A. Bureau of Public Roads, of some of the fundamental properties of concrete that underlie the behavior of this material in structures. Part 1 deals with changes of volume of cements and concretes, part 2 with fatigue of mortar and concrete, and part 3 with extensibility of concrete, considerable data being reported. An extensive bibliography is appended.

Some permeability studies of concrete, F. R. McMillan and I. Lyse (*Jour. Amer. Concrete Inst., 1 (1929), No. 2, pp. 101–142, figs. 20*).—The tests reported in this paper were undertaken at the research laboratory of the Portland Cement Association for the special purpose of studying the water-tightness of concrete mixtures as part of a general investigation covering the factors affecting the durability of concrete. A method of making permeability tests quickly and easily was developed. The test results show that this test is very sensitive.

Minor defects in concrete that would have no appreciable effect on the compressive strength affect the flow of water through the concrete under pressure to a marked degree. Defects in placing appear to be much more important in the leakage than the ordinary differences in mixtures, materials, or water content. The most significant results show the effect of continued moist curing in increasing the water-tightness of concrete.

It was demonstrated that for all the ordinary mixes encountered in practice the usual 28-day moist curing at 70° F. produced concrete through which no water would flow under pressures up to 120 lbs. per square inch. Tests using shorter moist-curing periods showed very rapid increases in water-tightness with increases in length of moist-curing periods, which held regardless of other factors of the tests. The results showed also the importance of quantity of mixing water in water-tightness, this being second in importance only to the length of moist curing. An increase in the quantity of mixing water was accompanied by a reduction in water-tightness, regardless of the curing period or the characteristics of the cement used. For the equivalent of 3 days' moist curing at 70°, concrete and mortar with a water-cement ratio of 5 gal. per sack or less showed no leakage of water under pressures up to 80 lbs. per square inch. For an equivalent of 7 days moist curing at 70° the water ratio necessary to produce such complete water-tightness was found to be 6 gal. per sack. Water-cement ratios of 9 gal. per sack produced complete water-tightness for 28 days' curing.

The results also showed that after test specimens were removed from the saturated atmosphere of the moist room and placed in the atmosphere of about 50 per cent relative humidity there was practically no increase in water-tightness. This was true of specimens tested at various periods up to 6 months. This result is taken to indicate that progressive building up to the internal structure of the concrete by curing can not take place unless moisture is present for the continued chemical reactions.

The tests using cements of different characteristics showed that the development of water-tightness at the early ages was comparable with the development of compressive strength. Those cements which gained their strength rapidly during the first few days were found also to gain water-tightness more rapidly. Studies of some of the common powedered admixtures showed that additions of those materials which required extra water to maintain plasticity reduced water-tightness, while with those materials which required no extra water there was some slight improvement. The changes brought about by these additions, however, are quite insignificant in comparison with the effects produced by a few days' change in the period of moist curing or a moderate reduction in the water content.

The results of the freezing and thawing tests showed the marked advantage of a low water-cement ratio in increasing the resistance of concrete to freezing.

Standardization of bridges with reference to farm roads [trans. title], HEIMERLE (*Kulturtechniker, 32 (1929), No. 2, pp. 151–154, figs. 11*).—Standard loadings and other design data for farm bridges to meet the requirements of farm transport, including machinery, trucks, and tractors, are presented. These are based on farm conditions in Germany.

Public Roads, [March–April, 1930] (*U. S. Dept. Agr., Public Roads, 11 (1930), Nos. 1, pp. 1–23+[2], figs. 22; 2. pp. 25–40+[2], figs. 23*).—These numbers of this periodical contain the status of Federal-aid road construction as of February 28 and March 31, 1930, respectively, together with the following:

No. 1.—Computation of Stresses in Bridge Slabs Due to Wheel Loads, by H. M. Westergaard (pp. 1–23).

No. 2.—Drinking Fountains along Oregon Highways, by T. M. Davis (pp. 25–29); Flow of Flood Water over Railway and Highway Embankments, by D. L. Yarnell and F. A. Nagler (pp. 30–34); Motor Vehicle Registrations and Revenue and Gasoline Taxes in 1929 (pp. 36–39); and Soil Sampling with a Compressed Air Unit, by H. F. Blaney and C. A. Taylor (p. 40).

Big teams on Illinois farms, E. T. ROBBINS (*Illinois Sta. Circ. 355 (1930), pp. 32, figs. 39*).—Practical information on the use of four-horse tandems and other hitches in farm draft operations is given in this circular, which supersedes Circular 324 of the station (E. S. R., 58, p. 780).

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the New Hampshire Station, 1929] (*New Hampshire Sta. Bul. 250 (1930), pp. 4–9, figs. 2*).—Results of investigations not previously noted are reported as follows:

Consumer demand for potatoes.—Interviews, under the supervision of E. H. Rinear, in 1,050 homes in 6 New Hampshire cities showed that a majority of the housewives preferred potatoes not less than 2.11 in. in width, that 1 pk. was the most popular size of purchase, and that only 24 per cent of the consumers purchased direct from farmers. The yearly consumption per person was found to vary with the income and nationality of the family and averaged 3.26 bu. for all persons included in the survey. Of the housewives, 27 per cent preferred New Hampshire grown potatoes, 11 per cent Maine grown potatoes, and 62 per cent were indifferent.

Costs of retailing grain.—Analyses of cost accounts of 35 representative businesses, by Rinear, showed that the average gross margin taken was 11.5 cts. on the dollar, of which 2.7 cts. were for fixed costs, 5.3 cts. for labor, 1 ct. for delivery costs, and 1.8 cts. for miscellaneous costs, leaving a net profit of slightly less than 0.7 ct. With two exceptions, stores with average yearly sales of less than $31,000 for each man employed and labor costs of more than 5.3 cts. per dollar of sales operated at a loss.

Time studies in haying and ensiling corn.—A study, made by M. F. Abell, showed that the average labor requirement for raising and ensiling a ton of corn silage on 86 farms was 6.5 hours and for raising hay on 54 farms 8.4 hours per ton. Farms with 4 acres of corn required 80 man hours per acre for raising and ensiling and those with 17 acres 51 hours. On hilly land 77 hours were required as compared with 57 hours on level land. Cutting and harvesting with a harvester saved from 20 to 25 hours per acre. A combination of tractor preparation, machine planting, and harvesting and the use of a low loading rack required 45 hours, as compared with 78 hours for horse preparation and hand methods. Bunching hay with a dump rake for hand loading saved about 12 per cent of the labor. In mechanically equipped barns those with the hoist in the center were 14 per cent more efficient than those in which the unloading was done from either end.

Time studies in orchards.—The 3-year study of orchard practices carried on by H. C. Woodworth and G. F. Potter showed that the average cost of production, not including overhead, was 36.13 cts. per box, being $2,380 per 1,000 mature trees divided as follows: Labor $1,120.80, use of truck $10.31, spraying material $436.40, fertilizer $499.42, maintenance of sprayers and dusters $91, and charge for land $222.22. For the 3 years the average value to apple growers before harvesting was 79 cts. per box. A chart is included showing the number of hours required in different operations per 1,000 mature trees.

Agricultural economics, C. S. Orwin (In *Agricultural Research in 1928. London: Roy. Agr. Soc. England, 1929, pp. 52–76, figs. 2*).—Short summaries are given of the research work during the year in costs of production and financial returns from milk, beef, corn, pigs, poultry, and root crops; costs of horse and tractor work; agricultural insurance and credit; marketing and cooperation; economic conditions and policy; and methods of study in agricultural economics.

Some economic and social accompaniments of the mechanization of agriculture, E. G. Nourse (*Amer. Econ. Rev., 20 (1930), No. 1, Sup., pp. 114–132, fig. 1*).—This is a paper read at the forty-second annual meeting of the American Economic Association at Washington, D. C., in December, 1929.

The national income and its purchasing power, W. I. King and L. Epstein (*Natl. Bur. Econ. Research* [*New York*] *Pub. 15* (*1930*), *pp. 394, figs. 60*).—A chapter (pp. 291–314) in this volume, which reports the results of a study made for the National Bureau of Economic Research, is devoted to the presentation of tables, charts, and discussion of the facts bearing on agricultural income.

Real estate problems, edited by K. Scholz (*Ann. Amer. Acad. Polit. and Social Sci., 148 (1930), No. 237, pp. [IX]+1–243, figs. 6*).—The purpose of this volume is "to indicate some of the many complex economic and social problems incidental to man's uses and abuses of some of the productive properties of land." The following articles pertain to rural real estate problems: The

Surplus Farm Lands, by B. Ostrolenk (pp. 207–211); Tenancy Versus Ownership as a Problem in the Utilization of Farm Real Estate, by L. C. Gray (pp. 212–218); The Overhead Costs of Farm Real Estate Ownership, by B. Ostrolenk (pp. 219–224); A Comparison between Urban and Rural Taxation on Real Estate Values, by M. S. Kendrick (pp. 225–232); and Farm Real Estate Values and Farm Income, by E. H. Wiecking (pp. 233–243).

Other articles bearing on urban real estate and land in general are as follows: Real Estate and Real Estate Problems, by W. C. Harris (pp. 1–6); Research Development in Real Estate in the United States, by A. J. Mertzke (pp. 7–11); The Economic Importance of Real Estate Classification, by A. G. Hinman (pp. 12–18); Real Estate as a Marketable Commodity, by W. H. Ten Haken (pp. 19–25); An Organized Real Estate Securities Exchange, by C. C. Miller (pp. 26–32); English Professional Societies in Real Estate, by H. M. Bodfish (pp. 33–49); The Indestructible Properties of Land, by W. H. Voskuil (pp. 50–55); Limitations to Private Property Rights in Land in the United States, by W. C. Plummer (pp. 56–60); The Distinction between Value and Valuation and Its Application to Real Estate, by W. Hoot (pp. 61–66); The Unearned Increment in Land Values and Its Social Implications, by W. N. Loucks (pp. 67–81); Land Value Insurance: Its Organization and Its Operation, by H. H. Richardson (pp. 82–87); Commonly Accepted Evidences of Real Estate Value for Purposes of Taxation, by D. T. Rowlands (pp. 88–96); A Scientific Approach to Real Estate Valuation, by W. W. Pollock (pp. 97–105); The Interdependence of Land and Public Utilities, by P. J. Raver (pp. 106–114); A National Land Policy to Conserve Land Values, by B. H. Hibbard (pp. 115–119); The Influence of Public Improvements on Land Values, by H. D. Simpson (pp. 120–132); Blighted Areas and Their Effects upon Urban Land Utilization, by C. L. Knight (pp. 133–138); The Operation of the Graded Tax Law in Pittsburgh, by T. C. McMahon (pp. 139–144); A Critical Analysis of the Operation of the Pittsburgh Graded Tax Law, by E. F. Daume (pp. 145–156); Inadequacy of Actual Selling Price of Real Estate as Evidence of Fair Present Value for Purposes of Taxation, by K. Scholz (pp. 157–164); Taxing Land Values and Taxing Building Values, by R. T. Ely (pp. 165–169); Trends in Urban Real Estate Values, Past and Present, by S. L. McMichael (pp. 170–176); The Going Value of Real Estate, by P. H. Cornick (pp. 177–183); Tenancy Versus Ownership as a Problem in Urban Land Utilization, by G. S. Wehrwein and C. Woodbury (pp. 184–198); and Public Guidance in Urban Land Utilization, by S. P. Wetherill, jr. (pp. 199–206).

Agricultural outgoing claims, D. MARSHALL (*Edinburgh: William Hodge & Co., 1929, pp. XIII+332*).—The statutory provisions, court decisions, and common-law rules applicable to waygoing valuations, fixtures and fittings, compensation for tenant's improvements, cumulative fertility, freedom of cropping and disposal of produce, compensation for disturbance, offer to withdraw notice to quit, landlord's claims at outgoing, particulars of claims, arbitration as to rent, records of holdings, and market garden compensation are brought together in narrative form and their application to questions of interest to the agriculturist discussed.

Appendixes include an index and synopsis of statutory notices, forms for use in connection with outgoing claims, the text of the Agricultural Holdings (Scotland) Act, 1923, and the forms prescribed by the Department of Agriculture for Scotland in connection with arbitration under the statute.

The agricultural credit situation in Louisiana, R. L. THOMPSON (*Louisiana Stas. Bul. 208 (1930), pp. 101, figs. 6*).—The study reported on in this bulletin was limited to agricultural production credit and did not include owner-operators or croppers on large cotton plantations in the Red River bottoms. The principal sources of data were reports of the U. S. Department of Agriculture, Comptroller of the Currency, and Bureau of the Census, the Federal Farm Loan Board, and the State Banking Department of Louisiana; records obtained by a field survey in the fall of 1928 and spring of 1929 from 809 farmers, 38 merchants, 26 banks, 46 national farm loan associations, 12 local farm associations, 4 land companies, and 11 insurance companies; and personal visits to different parts of the State. The credit institutions of the State; the factors—type of farming, value of land and equipment, expenses of crop production, and financial condition—affecting credit needs; the availability, uses, terms, costs, etc., of different types of credit; the relation of mortgage credit to land tenure; and the Louisiana farmer as a credit risk are discussed.

Suggestions are made of ways of improving the credit situation in Louisiana and of further lines of research needed.

The study was made in cooperation with the Louisiana State University.

Types-of-farming in Oklahoma, J. O. Ellsworth and F. F. Elliott (*Oklahoma Sta. Bul. 181 (1929), pp. 84, figs. 18*).—This bulletin, prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics, is based on data collected by the U. S. Department of Agriculture, U. S. Bureau of the Census, Oklahoma State Board of Agriculture, and Oklahoma Agricultural and Mechanical College. The soil, topography, water supply, climate, and land utilization; trends in size of farms, mortgage indebtedness, and use of farm capital; and areas in different crops in the 10 type-of-farming areas of the State are discussed. In determining the important farming systems on farms of different sizes in the 10 areas, approximately 7,300 individual organizations shown by a special tabulation of the 1925 U. S. Agricultural Census were examined. Tables are included showing typical farming systems for farms of different sizes in typical subareas of the type-of-farming areas, and also comparisons of returns under different conditions between a 160-acre farm in Garfield County under its past organization and under a reorganization plan.

Agriculture in Pennsylvania: A study of trends, county and State, since 1840, G. F. Johnson (*Penn. Dept. Agr. Bul. 484 (1929), pp. 94, figs. 16*).—The trends, as indicated by Federal censuses from 1840 to 1925, inclusive, in population, number and size of farms, land utilization, production per farm, the principal field crops, different types of livestock, the poultry and fruit industries, and vegetable, apiary, and maple products are analyzed.

The incidence of farming prosperity and depression: A survey of conditions in England to-day, D. Skilbeck and M. Messer (*Oxford: Univ. Oxford, Agr. Econ. Research Inst., 1929, pp. 31, figs. 2*).—The data on which this report is based were obtained by an inquiry made in December, 1928, and directed to the members of the Land Agents' Society and of the Surveyors' Institution engaged in the management of agricultural estates. Quantitative analysis showed that the frequency of notices to quit farms and the demands for reductions in rent increased rapidly both as the size of holding and the percentage of arable land in the farms increased. Qualitative analysis of the influence of soil, climate, and economic factors on the present position of the agricultural industry is also made. Brief statements as to the conditions in different counties are included.

The farmer's business: A study based on conditions in part of South Oxfordshire in 1923, R. N. Dixey and A. Bridges (*Oxford: Univ. Oxford, Agr. Econ. Research Inst., 1929, pp. 47, pl. 1, figs. 4*).—An analysis is made of information obtained by personal interviews with farmers during the winter of 1923–24 on 148 farms ranging in size from 11 to 1,500 acres and including approximately 30,000 acres. The influence of size of farm and type of farming on profits is discussed, and business analyses are made of the standard practices of 57 milk-selling farms, 32 of such farms showing profits above the average and 25 showing lower profits or losses, and of 42 crop-selling farms, 19 of such farms showing profits above the average and 19 showing losses.

An analysis of the business of the Poultry Producers of Central California, A. V. SWARTHOUT (*U. S. Dept. Agr. Circ. 111 (1930), pp. 52, figs. 17*).—The results are presented of a study begun in September, 1926, of the operations of the Poultry Producers of Central California, a cooperative organization which began business January 1, 1917. Analysis is made of the organization, membership relations, and operations of the company, and of prices, relation of egg supply to prices, market preferences, and the price and sales policies on the Pacific coast and in eastern markets. The benefits of the organization to its members are discussed.

Factors relating to the price of Idaho potatoes, R. B. HEFLEBOWER (*Idaho Sta. Bul. 166 (1929), pp. 32, figs. 10*).—Multiple correlation analysis covering the period 1909–1928 of Idaho potato prices with deviations in percentages from the trend of production in (A) the far West, (B) the Central States, and (C) the far East, and (D) wholesale price index of all commodities gave a coefficient of 0.9706.

The coefficients of determination for the four factors were 20.1, 32.5, 16.6, and 25, respectively. The average deviation of the estimated yearly (except 1917) prices from actual yearly prices was 11.7 per cent, varying from 24.2 to —26.3 per cent. The deviations of monthly prices in cents per 100 lbs. (except 1917) ranged as follows: October 109 and —36, averaging 21.4; November 26 and —67, averaging 17.5; December 63 and —25, averaging 15.4; January 78 and 48, averaging 22.1; February 66 and 49, averaging 22.4; and March 141 and 45, averaging 31.6. Using farm products price indexes instead of all commodity indexes, the average deviation was 11.6 per cent, ranging from 24.2 to —30 per cent.

The relation of production to the price of Idaho potatoes and the differential obtained by Idaho potatoes on the Chicago market are discussed. The method of estimating the price in future seasons is outlined.

Canned tomatoes and tomato paste, T. O. MARVIN ET AL. (*Washington: U. S. Tariff Comm., 1929, pp. V+79, figs. 2*).—This is the report of the U. S. Tariff Commission to the President of the United States on the differences in costs of production of canned tomatoes and tomato paste in the United States and Italy, the principal competing country.

Information is given regarding the production and costs of production of tomatoes, canned tomatoes, and tomato paste in the two countries, together with costs of transportation to New York City. The rates of duty necessary to equalize the difference in costs of production were found to be 22.5 per cent ad valorem on canned tomatoes and 20 per cent ad valorem on tomato paste.

Marketing and the national mark, A. W. STREET (*Jour. Farmers' Club [London], 1930, pt. 2, pp. 29–51*).—The progress that has been made and the results obtained under the Agricultural Produce (Grading and Marking) Act, 1928, are described. Several discussions of the paper are included.

Protein and country elevator buying, E. A. STOKDYK and C. A. HOFFMAN (*Grain Dealers Jour., 64 (1930), No. 6, pp. 396, 397*).—The difficulties encountered in buying wheat on a protein basis by country elevators are discussed. A comparison of tests on samples from 16 car lots of Kansas wheat drawn (1) from the cars and (2) from the bins before loading showed that 3 car samples tested 0.20 to 0.46 per cent, averaging 0.31 per cent, more protein, 11 bin samples tested 0.02 to 0.73 per cent, averaging 0.30 per cent, more protein, and in two cases the tests were the same.

In view of the data and the rules of contract on track sales, the authors find that country elevators buying on a protein basis must bid on a basis of at least 0.25 per cent below the protein test.

The cooperative marketing of fruits and vegetables on the St. Louis market, F. L. Thomsen (*Missouri Sta. Bul. 277 (1929), pp. 52, figs. 19*).—The results are presented of a study made of the St. Louis County Growers' Cooperative Sales Co., a cooperative commission house organized in May, 1926. The characteristics of the St. Louis produce market; the organization, operations, causes of financial difficulties, present status, future prospects, etc., of the company; and the opportunities for market improvement by a cooperative commission firm are discussed; and plans for two types of such an organization are briefly outlined.

Handbook of foreign tariffs and import regulations on agricultural products.—I, Fresh fruits and vegetables. II, Canned foods in Europe, R. S. Hollingshead and R. P. Wakefield (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser., 1929, Nos. 79, pp. VI+109; 85, pp. XI+287*).—Information is given as to the United States exports to different countries, the import duties levied, and the regulations on the admission of foreign goods into the different countries.

International trade in citrus fruits, D. J. Moriarty (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 77 (1929), pp. II+46, figs. 18*).—Information is given as to the production, exports, imports, and trade trends of different countries. The present foreign markets for United States citrus fruits are treated in detail.

Crops and Markets, [April, 1930] (*U. S. Dept. Agr., Crops and Markets, 7 (1930), No. 4, pp. 113–152, figs. 3*).—Tables, reports, summaries, notes, and charts of the usual types are included, together with tables showing the intended plantings in 1930 of different crops, by States; prices of purebred cattle, hogs, and sheep, 1929; and unloads of 18 fruits and vegetables in 66 cities during 1929; and a discussion of the relation of farmers' planting intentions to the agricultural outlook for 1930.

The consumption of dairy products by 1,370 families in Philadelphia, F. F. Lininger and H. Metzger (*Pennsylvania Sta. Bul. 245 (1930), pp. 16, fig. 1*).—This bulletin, prepared in cooperation with the Bureau of Agricultural Economics, U. S. D. A., is based on data obtained in June, 1929, from 76 wealthy, 131 well-to-do, 634 middle class, and 529 poor families on 24 milk routes of 7 distributors in Philadelphia. Tables are included showing the relations of income, size of family, and nationality to milk consumption per family; the changes in consumption since 1924; consumption of other dairy products; results of different kinds of advertising; and the reason for using condensed or evaporated milk.

The daily per capita consumption for the different income groups averaged 0.82, 0.93, 0.83, and 0.67 pints, respectively. The average total consumption was 0.77 pints per capita, an increase of 11.6 per cent over 1924.

Social mobility among farm owner operators, W. A. Anderson (*Social Forces, 8 (1930), No. 3, pp. 378–380*).—A study of over 200 families in North Carolina in 1928 showed that 91 per cent of the owners were born within the State, 81 per cent within the county, and 66 per cent within the township where they now live; 97 per cent were born in the open country; 51.5 per cent had farmed all their working days; and 26 per cent had had but one occupation other than farming. Of the fathers of the owners and their wives 92 and 84 per cent, respectively, were farmers, and of the grandfathers 79 and 80 per cent, respectively. The total group of owners had worked an average of 24.4 years and had spent 23.6 years consecutively in farming. Seventy per cent began farming as owners, 16 per cent as renters, and 14 per cent as laborers. Ownership, either through purchase or inheritance, was the chief reason given for farming. Only 18 per cent stated that the suggestion of their fathers had led them into farming.

Rural community organization: A comparative study of two rural communities in northern Illinois, M. L. WHITTAKER (*North. Ill. State Teachers Col. Quart., 24 (1929), No. 2, pp. 38, figs. 3*).—This is a comparative study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of two communities with nearly identical physical situation. In one an effective community organization had existed over a long period, while in the other such organization had been maintained intermittently. The data were obtained by a questionnaire, a house-to-house canvass, interviews with teachers, bankers, and other leaders, and by intelligence tests.

Proceedings [of] Conference on Rural Family Relations, edited by D. TYLER (*Detroit: Merrill-Palmer School, 1929, pp. V+83*).—This mimeographed volume contains the following papers and discussions thereon presented at the conference held at Detroit, Mich., March 23 and 24, 1929: Backgrounds and Objectives of the Conference, by A. R. Mann (pp. 1, 2); Points of View in Family Research, by L. K. Frank (pp. 3–5); A Joint Research Project on the Standard of Living of Farm Families, University of Missouri, by E. L. Morgan (pp. 15, 16); A Research Project in Rural Family Relationships, New York State College of Agriculture, by D. Sanderson (pp. 18, 19); A Cooperative Project in Family Research at the University of Wisconsin, by J. H. Kolb (pp. 21, 22); Projects of the Vermont Commission on Country Life, by H. C. Taylor (pp. 24–29); Report of the Committees on Clarifying the Objectives of the Conference, by E. F. Zinn (pp. 33, 34); Disorganization in the Rural Family, by E. R. Mowrer (pp. 35–37); Findings of the Commission on Divorce of the Episcopal Church, by D. Hughitt (pp. 39, 40); The Psychiatrist and Family Disorganization, by A. M. Barrett (p. 42); Opportunities Offered by Cooperative Research, by E. W. Allen (pp. 47, 48); Home Management and Rural Family Relations, by A. E. Richardson (pp. 50–52); Methods of Approach to the Family in the Middletown Study, by D. D. Frank (pp. 53, 54); A Survey of Rural Family Living Conditions as a Basis for Extension Teaching in New York, by M. Van Rensselaer (p. 58); The Analogy of Rating Qualitative Data on the Child and on the Family, by R. Stutsman (pp. 67, 68); A Cornell Project on Household Activities and Family Development, by C. Nye (pp. 72, 73); Summary of the Conference Proceedings, by A. R. Mann (pp. 79–81); and Report of the Committee on the Formulation of a Research Program in Rural Family Relationships (pp. 82, 83).

Fifth annual report of the Social Science Research Council (*Social Sci. Research Council Ann. Rpt., 5 (1928–29), pp. XIII+58*).—This is the fifth report of the series previously noted (E. S. R., 60, p. 685).

The 1929 Institute of Rural Affairs proceedings (*Va. Polytech. Inst. Bul., 23 (1930), No. 3, pp. 187, figs. 5*).—Included are a brief description of the history and purpose of the Institute of Rural Affairs and the following papers presented at the first meeting, held at the Virginia Polytechnic Institute, July 30 to August 2, 1929: America's Position in World Agriculture, by E. G. Nourse (pp. 8–12); What Protection Does the Farmer Get from the Tariff? by C. L. King (pp. 13–24); Means of Preventing Surplus Production, by W. J. Spillman (pp. 25–39); Farm Relief at Minimum Cost, by C. Vrooman (pp. 40–45);

Methods of Taking Care of Surplus, by C. L. King (pp. 46–51); Taxes and the Farmer, by E. Englund (pp. 52–55); Suggested Tax Reforms, by M. Graves (pp. 56–59); Satisfactory Standards of Living for the Farm Home, by G. M. Bane (pp. 60–70); Rural-Urban Migration as a Factor in Standards of Living, by C. C. Zimmerman (pp. 71–87); Farm Migration in Ten Eastern Virginia Counties, by W. Gee (pp. 88–101); The Challenge of Agriculture to the Rural Church, by E. L. Earp (pp. 102–110); What the Church is Doing in Behalf of Rural Living Standards in Virginia, by C. H. Hamilton (pp. 111–123); What the Country Church Can Do to Promote Better Living Standards through Leadership Training, by H. W. McLaughlin (pp. 124–126); What the Country Church Can Do to Promote Better Living Standards through Social Service, by F. D. Goodwin (pp. 127–132); Community Organization in Relation to Higher Standards of Living, by B. L. Hummel (pp. 133–140); The Grange Program, by L. J. Taber (pp. 141–145); Problems Arising from the Application of Modern Machinery in Farming, by C. O. Reed (pp. 146–156); The Adaptation of Machinery to Crop Production, by S. P. Lyle (pp. 157–161); The Rural Electrification Problem, by G. W. Kable (pp. 162–171); How Electric Power May Be Applied to Farming, by E. W. Lehmann, (pp. 172–180); and More Power to the Farm Home, by E. Davison (pp. 181–187).

FOODS—HUMAN NUTRITION

Food consumption and food expenditures in relation to standards of requirements and family income, M. W. Talbott (*Idaho Sta. Bul. 165* (*1929*), *pp. 19*).—In this investigation of the food consumption habits of farm and small town families in Idaho, complete 7-day records were received from 70 families. Of these, 38 returned both winter and summer records, 24 winter records, and 8 summer records, making a total of 62 individual winter and 46 summer records. Over half of the winter records were kept in January and February and the rest in March, April, and May, while the summer records were all kept during the months of July and August.

The nutritive values were calculated in terms of adult male units according to the Hawley double scale method (E. S. R., 58, p. 84) and compared with the Sherman standards. The average values per adult male unit were 3,700 calories, 1.1 gm. of calcium, 1.7 gm. of phosphorus, and 0.017 gm. of iron, these values being, respectively, 1.2, 1.6, 1.3, and 1.1 times the standard. Thirteen of the individual family dietaries were low in calories, 12 in protein, 7 in calcium, 8 in phosphorus, and 29 in iron. The chief difference between the winter and summer dietaries was a higher calorie consumption during the winter months.

The total quantity of fruits and vegetables for the week, calculated in terms of the average family, compared favorably with the standards proposed by Hunt (E. S. R., 46, p. 666). In the winter dietaries, however, the potato consumption was 1½ times the standard, while the consumption of leafy and green vegetables was much too low. In the summer dietaries the consumption of fruits and vegetables compared favorably with the standards.

The milk consumption, based on the standard of 1 qt. of whole milk a day for each growing child and 1 pint for each adult, was adequate in 31 dietaries and deficient in 77. The large amount of skim milk consumed, however, made up for any inadequacies in the protein and minerals, but not in vitamin A.

The average cost of the food consumed per adult male unit per day was 50 cts., with no difference in the average for summer and winter dietaries. Of this, 49 per cent represented food furnished by the farm in the winter dietaries and 55 per cent in summer dietaries. The average distribution of expenditures for different foods was somewhat lower than the Sherman standard for milk, butter, and other fats and higher for sugar and sweets and for fruits and vegetables.

It is thought that the chief inadequacies of the diets were in leafy and green vegetables, especially in winter months, and in whole milk consumption, especially in families where there were growing children.

Breadmaking: Its principles and practice, E. B. Bennion (*London: Humphrey Milford, Oxford Univ. Press, 1929, pp. [VIII]+251, figs. 44*).—In this textbook for students in bread making, "an attempt has been made to add a volume to trade literature which will in some measure help to fill the gap which up to now has existed between the small works dealing with general principles and the advanced treatises on the subject of bread making and cereal chemistry."

Whole wheat bread and white bread: A comparative study, R. McCarrison (*Indian Jour. Med. Research, 17 (1930), No. 3, pp. 667–691, pl. 1, figs. 48*).—Essentially noted from a preliminary report (E. S. R., 62, p. 787).

The relative digestibility of unsweetened evaporated milk, boiled milk, and raw milk by trypsin in vitro, Z. Wallen-Lawrence and F. C. Koch (*Amer. Jour. Diseases Children, 39 (1930), No. 1, pp. 18–33, figs. 10*).—In an effort to determine why heat-treated milk, particularly boiled or evaporated, is more readily digested than raw milk, as has been shown by various investigators, including Marriott and Schoenthal (E. S. R., 61, p. 588) and Brennemann (E. S. R., 61, p. 892), the authors have studied the relative digestibility by trypsin in vitro of raw, pasteurized, and boiled milk with the conclusion that the increase in trypsin digestibility of milk brought about by heating is due to some heat-labile tryptic inhibitor in milk. "It is suggested that no practical significance can be attached to these results until the effect of peptic digestion as a precursor to tryptic digestion has been studied. The question whether the physical nature of the curd alone is responsible for the greater digestibility of heat-treated milk in the stomach remains unanswered."

The nutritive value of tinmilk and milkpowder, W. F. Donath (*Meded. Dienst Volksgezondh. Nederland. Indië, 18 (1929), No. 2, pp. 247–303, pl. 1*).—This report of studies on the content of vitamins A, B_1, and C in various commercial brands of dried, evaporated, and condensed milk on the market in Weltevreden, Dutch East Indies, contains an extensive review of the literature on the vitamin content of milk preserved in various ways. The findings in the present study confirm previous reports, indicating no appreciable loss of vitamin A, a considerable loss in B_1, and practically complete disappearance of C.

The nature and biological availability of almond carbohydrates, A. F. Morgan, C. M. Strauch, and F. Blume (*Jour. Biol. Chem., 85 (1930), No. 2, pp. 385–404*).—This study was undertaken as an outcome of an earlier investigation in which certain results pointed to the presence of a bulky unabsorbable fraction in almond carbohydrates (E. S. R., 50, p. 857). The almonds used in the present study were sheller-run seedlings and Nonpareils of the 1925 crop. The nuts were blanched, dried, and ground and most of the fat was removed by pressure, followed by extraction with boiling anhydrous ether.

Proximate analyses are reported for the meal as thus prepared from the two varieties and, for purposes of comparison, of the whole blanched nut of the same varieties as analyzed by V. MacNair and of other values reported in the literature. Separation and identification of the carbohydrates which constituted about 30 per cent of the meal showed that they consisted of "sucrose one-third, cellulose one-seventh, pentosans one-fourth, and the undetermined remainder, about 40 per cent, probably of difficultly hydrolyzable hemicelluloses, or alkaloids, acids, tannins, or other noncarbohydrate substances. About one-third of the material usually reported as carbohydrate in this nut may therefore be expected to be available in the animal body."

The digestibility of the almond carbohydrates was tested by feeding corresponding groups of rats a diet made up of 70 per cent almond meal and 30 per cent almond oil, and a control diet of nearly the same proximate composition consisting of casein 38, cornstarch 24, Osborne and Mendel salt mixture 4.5, and almond oil 33 per cent. Both groups received 0.5 gm. of yeast and 3 drops of cod-liver oil per rat per day, fed separately from the diet. The weights of both fresh and dried feces excreted by the almond-fed rats were from two to three times as great as those excreted by the control rats, thus showing a marked laxative effect of the meal. Pentosans and crude fiber found in the feces of the rats on the almond diet represented only 8.5 and 27 per cent, respectively, of these substances in the food eaten. It is thought that this loss is attributable to bacterial action in the intestines rather than to availability in metabolism.

In order to determine what proportion of almond carbohydrate is utilized in glycogen formation, rats fed both the almond and the control diets were fasted for 24 hours, fed for 24 hours, and then killed and analyzed for blood sugar, liver glycogen, and body glycogen. In all cases the almond-fed rats showed lower blood sugar values than the control rats and only about one-third as much glycogen.

"These findings indicate the possible usefulness of almonds or almond meal in low carbohydrate diets, such as are used for diabetics and in the ketogenic dietetic treatment of epileptic children. The bulky fecal residue resulting from the use of the nut, which is probably partly due to the unabsorbable carbohydrate, indicates the laxative character of this food."

Pasteurized dried fruits, C. R. FELLERS (*Amer. Jour. Pub. Health, 20 (1930), No. 2, pp. 175–181*).—Following a general description of methods employed in the preparation of dried fruits, data are reported and discussed on the number of bacteria, molds, and yeasts per gram and the number of samples containing lactose fermenters in various bulk and packaged American dried fruits as purchased.

The data showed wide variations in the number of micoorganisms, although very few samples contained lactose fermenters. In general the counts on raw dates were the highest and sulfured fruits the lowest, although the counts were also very low in pasteurized fruits. Pasteurization with moist heat is recommended as not only keeping down the number of organisms but also improving the appearance, texture, and flavor of the product. Preliminary tests have shown that different treatments are required for each fruit and often for different varieties of the same fruit. The conditions which have been found most effective at humidities of from 70 to 100 per cent varied in temperature from 150 to 185° F., and in time from 30 to 70 minutes.

Nutrition laboratory, F. G. BENEDICT (*Carnegie Inst. Wash. Yearbook 28 (1928–29) pp. 147–159*).—This is the customary annual report (E. S. R., 61, p. 290), including brief accounts of the investigations in progress and abstracts of published reports, most of which have been noted from other sources (E. S. R., 60, pp. 389, 390, 391, 392; 61, p. 591; 62, p. 192).

New method for the determination of the basal metabolism of babies and of small children, H. L. HIGGINS and V. BATES (*Amer. Jour. Diseases Children, 39 (1930), No. 1, pp. 71–75, figs. 2*).—A rapid method of determining the basal metabolism of babies and small children is reported, with data and calculations illustrating its use. Many of the features of the method of Benedict and Talbot (E. S. R., 32, p. 461) have been retained, but the technic has been modified so that it now requires only from 2 to 4 minutes for a single test. Three or four tests are taken in succession, the whole operation involving only 25 to 45 minutes. The respiration chamber is such as described by Benedict and Talbot (E. S. R., 45, p. 561). A blower with rheostat connection to the operating motor capable of ventilating from 8 to 30 liters per minute makes it possible to adjust the speed of the air current to the size of the child and thus diminish the changes in residual carbon dioxide in the box at the beginning and end of each period.

Nomogram deriving basal metabolism from height-weight coordinates, C. BRUEN (*Jour. Biol. Chem., 85 (1930), No. 2, pp. 607–609, fig. 1*).—A nomogram is presented by means of which the basal metabolism per day (Du Bois) can be derived in one step from the sex, age, height, and weight.

An apparatus for the study of respiratory quotient and basal metabolism of mice, A. H. EBELING and R. B. COREY (*Jour. Expt. Med., 51 (1930), No. 1, pp. 41–50, figs. 2*).—In the apparatus described the animal is confined in a wire cage suspended in a closed glass chamber of about 500 cc. capacity. The carbon dioxide given off by the animal is absorbed by a N/20 solution of barium hydroxide introduced into the chamber from a burette at the beginning of the experiment. As the oxygen is consumed the pressure decreases, as indicated by the manometer, and barium hydroxide is run in as required to maintain the pressure. At the end of the experiment the excess barium hydroxide is titrated with a N/50 solution of oxalic acid. An air-propelled fan and a glass paddle mounted on the same shaft circulate the air and stir the liquid. The volume of oxygen consumed is given directly by the volume of barium hydroxide introduced during the experiment. The carbon dioxide is computed from the titration data, and the respiratory quotient is obtained by dividing this volume by the volume of oxygen consumed.

The technic is described in detail, with data, and a discussion of the factors affecting the accuracy of determinations. Values for the respiratory quotient are said to be accurate to within 0.02.

The basal metabolic rate in relation to the menstrual cycle, C. J. CONKLIN and J. F. MCCLENDON (*Arch. Int. Med., 45 (1930), No. 1, pp. 125–135, figs. 3*).—Basal metabolism determinations with the Benedict-Roth apparatus were conducted almost daily throughout one or more menstrual cycles on 10 normal women. One of the subjects during a little over 2 months, including three menstrual periods, lived on a constant weighed diet and did an almost invariable amount of work each day. Statistical analysis of the data obtained showed that the basal metabolic rate tended to reach its lowest level following menstruation and its highest shortly before menstruation. The weighed diet proved to be of insufficient calorie value, causing a loss of weight of about 7 per cent during the period. This was accompanied by a decrease in the basal metabolic rate, in the duration of menstruation, and in the length of the menstrual cycle.

Contribution to the study of basal metabolism of inhabitants of the Tropics [trans. title], P. J. TEDING VAN BERKHOUT (*Meded. Dienst Volksgezondh. Nederland. Indië, 18 (1929), No. 1, pp. 1–69, pls. [6], figs. [4]*).—An extensive review of the literature on basal metabolism, particularly studies dealing with metabolism in the Tropics, is followed by the report of basal metabolism determinations by a combination of the open and closed circuit systems of 12 Europeans, 8 Indo-Europeans, and 12 Malayans in Weltevreden. The extreme values for the Europeans and Indo-Europeans were −17.1 and +1.7

per cent in terms of the Du Bois standards and —13.5 and +5.7 per cent by the Benedict standards, the average values being —9 and —5.41 per cent, respectively. In the 12 Malayans the values ranged from —17.2 to —3.3 and from —15.1 to +2 per cent, with average values of —11.41 and —7.7 per cent, respectively.

The low values are considered to be statistically significant and to confirm the conclusions drawn by previous observers that long sojourn in the Tropics tends to lower metabolism.

The basal metabolism of inhabitants of tropical countries [trans. title], C. Eijkman (*Meded. Dienst Volksgezondh. Nederland. Indië, 18 (1929), No. 1, pp. 81–84*).—A reply to the criticism by Teding van Berkhout in the paper noted above of the author's earlier studies of basal metabolism in the Tropics.

Study of the heat production of inhabitants of the Tropics during walking on a horizontal surface [trans. title], P. J. Teding van Berkhout (*Meded. Dienst Volksgezondh. Nederland. Indië, 18 (1929), No. 1, pp. 71–80, pls. 2*).—The heat production was determined in 3 Europeans and 3 Malayans during walking for 5 minutes on a horizontal surface at speeds of 60 and 90 meters per minute. In the European subjects the increased heat production over the standing values varied from 0.366 to 0.464 gm. calories only, while that of the Malayans amounted to 0.492 to 0.633 gm. calories. In both groups the heat production was doubled when the speed was increased from 60 to 90 meters. The total heat production per horizontal kilogram meter was 25 per cent higher in the Malayans than in the Europeans, showing that for a return of 25 per cent in the latter that of the former would be only about 20 per cent.

Citric acid milk in infant feeding, J. E. Gonce, jr., and H. L. Templeton (*Amer. Jour. Diseases Children, 39 (1930), No. 2, pp. 265–276, figs. 3*).—This report of an investigation at the Wisconsin General Hospital of the value of citric acid as a substitute for lactic acid in milk modifications for infant feeding indicates that citric acid milk is easy to prepare, is well liked by infants, and never in itself causes persistent vomiting. The gastric curds at the height of digestion in infants fed whole citric acid milk are uniformly small. The stools are of a smooth, pasty, or firm consistency and rather more frequent than those of infants fed on simple milk dilution mixtures. In the amounts recommended, 4 gm. to 1 qt. of milk, the acid is said to be free from toxic action on the kidneys. "Consequently, since citric acid milk appears to equal lactic acid milk in the beneficial results, and because of its constant acceptability and ease of preparation, it is especially fitted for use in rural districts and in all homes in which ice can not be obtained."

Influence of feeding on certain acids in feces of infants.—III, A comparison of the effects of breast milk and of whole cow's milk on the excretion of volatile acids and of lactic acid, J. R. Gerstley, C. C. Wang, and A. A. Wood (*Amer. Jour. Diseases Children, 39 (1930), No. 3, pp. 487–492, fig. 1*).—Continuing the investigation noted previously (E. S. R., 60, p. 192), the authors have compared the acid output of infants on breast milk with that of infants on whole cow's milk, following essentially the same methods as in the earlier studies.

The same changes noted in the first paper of the series as occurring when infants were changed from breast milk to modified cow's milk were found to occur in more marked degree. On the whole cow's milk there was a decided tendency toward an increase in the output of acetic acid and the development of propionic acid, with the disappearance of formic acid. The total volatile acid excretion was higher and the lactic acid lower. The total titratable acid was often the same, but the pH of the stools of the infants fed cow's milk was invariably on the alkaline side. The total acid excretion is thought to be independent of the amount of lactose in the milk, inasmuch as the acid output of infants fed on whole cow's milk containing 4 per cent lactose was even greater than that of infants fed breast milk containing 7 per cent lactose. It is thought that "the older ideas of increased intestinal fermentation of lactose in cow's milk may not be as important as the problems of absorption of lactose."

The dietary production of dystrophy of the voluntary muscles, M. Goettsch (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 6, pp. 564–567*).—In this preliminary report of an investigation of the effect on guinea pigs of a diet free from vitamin E, changes in the voluntary muscles are described which, in the opinion of the author, are specific for vitamin E deficiency.

The diet used was a natural food mixture supposedly adequate in every respect, but with the vitamin E destroyed by shaking with ferric chloride, as described by Waddell and Steenbock (E. S. R., 61, p. 95). On this diet young guinea pigs stopped growing after from one to two months, maintained constant weight for another month, and then lost weight rapidly and died in 2 or 3 days. Of 19 animals which came to autopsy, all but 1 showed changes in the voluntary muscles described as follows:

"The muscles of the thigh and abdomen were particularly involved. They appeared atrophied and pale, and had a yellowish color quite different from those of the normal controls. Sometimes they were gritty looking and streaked as though calcified or infiltrated with fat. In 2 cases the thigh muscles were markedly hemorrhagic. The muscles seemed to have lost their irritability."

The other organs were normal, and the animals, while thin and flabby, were not particularly emaciated. Inanition was thought not to be the cause of the dystrophy, because some of the most pronounced lesions were found in actively growing animals. That the diet was deficient in vitamin E was demonstrated by the development of typical sterility in rats. Two rabbits fed the same diet lost the use of their muscles completely after 12 days and showed changes similar to those in the guinea pigs on autopsy.

Pathological changes in the skeletal muscles produced by dietary means, A. M. Pappenheimer (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 6, pp. 567, 568*).—A brief description is given of the pathological changes in the skeletal muscles of the guinea pigs and rabbits in the investigation noted above.

Recent advances in our knowledge of vitamins, S. J. Cowell (*Bul. Hyg., 4 (1929), No. 5, pp. 365–380*).—A concise review of recent literature, with a list of 157 references.

A new method of evaluating the potency of antineuritic concentrates, M. I. Smith (*Pub. Health Rpts. [U. S.], 45 (1930), No. 3, pp. 116–129, figs. 9*).—The new method described consists in maintaining rats on a diet deficient only in the antineuritic vitamin until typical polyneuritic symptoms appear and then administering the concentrate to be tested by injection into one of the veins of the tail. The smallest single dose sufficient to bring about a complete though temporary cure is considered the minimum protective dose. The same animal can be used repeatedly for testing.

Among the materials tested by the new method were two concentrates prepared by Seidell by the method described by him in 1926 (E. S. R., 55, p. 609) and a third by the improved technic recently described (E. S. R., 61, p. 710), and two concentrates prepared by the author by a new method which is essentially as follows:

Dried brewer's yeast is thoroughly triturated in a mortar with 5 volumes of N/25 acetic acid and placed in a cold room overnight. The extract is then centrifuged and the supernatant solution decanted, stirred into 2 volumes of 95 per cent alcohol, and left for several hours in the cold. The supernatant solution is again decanted, filtered, concentrated under reduced pressure to about one-twentieth of the original volume, poured slowly with stirring into 9 volumes of acetone, and left in the cold overnight, after which the solution is again decanted, filtered if necessary, and concentrated under reduced pressure to one-twentieth the original volume, diluted 10 times with distilled water and stirred thoroughly with one-fiftieth to one one-hundredth its weight of purified norite. This process is repeated 3 times, after which the combined adsorbates are treated on the water bath with about 5 times the volume of N/20 HCl in 50 per cent alcohol, and filtered under suction, this operation being repeated 3 times. The combined extracts are concentrated under reduced pressure to about one-twentieth their volume. This extract, which has a pH of about 2, has kept well in the cold for several months. When tested, it is diluted as required and made neutral to litmus by the addition of $NaHCO_3$. The yield of active material is roughly in the proportion of 1 gm. to 200 gm. of dried yeast.

A comparison of the relative potencies of the Seidell fractions as determined by the new method and by the Seidell method (E. S. R., 48, p. 12) showed a decided lack of agreement. It is suggested that the higher potency of one of the preparations, when determined by the pigeon test, may have been due to the beneficial effects of the mineral content upon the pigeons which, on polished rice, are suffering from mineral as well as vitamin deficiency. On the nitrogen basis, one of the Seidell and one of the author's fractions had about the same potency. This is in agreement with the theory that the antineuritic vitamin is a nitrogenous compound.

Preparations of autoclaved yeast and of a number of nonspecific substances and pharmacological agents were tested with consistently negative results. In the opinion of the author the method is more reliable than the pigeon test. "Apart from the question as to which of the two methods represents a more accurate index of the antineuritic potency of the above or any other concentrate, these results at least emphasize one point clearly, and that is the impossibility of comparing the merits of the various chemical procedures used by different men in the concentration and purification of the antineuritic vitamin unless one biologic method is adopted in common for testing of the potency of such concentrates."

Physiological functions of vitamins, R. R. WILLIAMS and W. H. EDDY (*Carnegie Inst. Wash. Yearbook 28 (1928–29), pp. 377–385*).—In this second progress report (E. S. R., 60, p. 897), the authors' findings concerning the four factors thought to be present in the vitamin B complex are summarized in turn.

The method by means of which Jansen and Donath (E. S. R., 57, p. 489) claimed the isolation of vitamin B_1 in pure form has been applied to the fractionation of rice polishings with greater success than reported in the previous progress report for yeast, but without confirmation of all of the claims of Jansen and Donath. Losses of activity in various steps of the process, both by removal in the fractions to be discarded and by apparent destruction, were greater than those reported by Jansen and Donath. The greatest losses appeared in the later stages of the fractionation, particularly in those involving the use of alkali. As an explanation of some of the discrepancies in estimates of the recoveries, differences in the method of physiological testing are suggested. In the opinion of the present authors the lapse of time before the onset of symptoms is less reliable than the use of a definite period of time for feeding the material in question. In checking the results against rats, it was found that the daily dose of antineuritic required by the young rat would ordinarily just serve to prevent polyneuritis in the pigeon if given every other day. In terms of unit weight this indicates that the young rat requires about 10 times as much vitamin B_1 as the adult pigeon.

Continued protection against polyneuritis, but at the same time loss in weight, on polished rice plus the crystalline B_1 preparation, is thought to confirm the authors' theory of a third factor in rice polishings necessary for the growth of pigeons but not for rats.

A comparison of the various fractions obtained by the Jansen and Donath method with corresponding fractions from the Kinnersley and Peters procedure (E. S. R., 58, p. 89) has shown that for pigeons the fractions are equivalent, but that the Kinnersley-Peters product after the removal of the norite promotes growth in rats when fed in large doses while the Jansen and Donath fraction does not. The fuller's earth product of Williams and Waterman (E. S. R., 60, p. 293) was also capable of promoting growth in young rats. "We, therefore, believe that while the antineuritic vitamin is common to all these preparations and represents their major constituent physiologically, only the Jansen and Donath substance approaches a high degree of physiological purity."

The studies on vitamin B_2 included unsuccessful attempts to separate B_1 and B_2 by autoclaving yeast (E. S. R., 62, p. 113) and an investigation of the possibility of using Liebig's beef extract and various fractions of autolyzed yeast extract as sources of vitamin B_2. The former proved to be practically free from vitamin B_1 and a fairly good source of B_2. When autolyzed yeast extract was made up to 66 per cent alcoholic strength, precipitated with barium hydroxide, filtered, and precipitated with mercuric chloride, the precipitate contained very little B_1 and the filtrate no B_2. The preparations of B_2 thus prepared from the beef extract and autolyzed yeast when supplemented with adequate B_1 promoted fair but subnormal growth in rats.

Vitamin B_3 (E. S. R., 60, p. 293) was found to be present in rice polish, wheat germ, whole barley, malted barley, autolyzed yeast extract, beef liver, and beef muscle, and in very meager amounts in milk, wheat bran, malt extract, cane molasses, spinach, orange juice, tomato juice, and potato juice. Brewer's yeast is considered to be the richest known source of this vitamin. It was present in malted grains but apparently not in the sprouts. The vitamin is highly thermolabile and is destroyed by cold alkali.

In support of the theory of a fourth component of the vitamin B complex, B_4, reference is made to various suggestions in the literature concerning the existence of such a factor and to failure in the authors' own experiments to secure completely satisfactory growth in rats with highly purified preparations of B_1 and B_2.

The work on bios has been extended to include the preparation of a crystalline acetylated addition product of the hygroscopic Beta-bios of Kerr (E. S. R., 59, p. 109). Duplicate elementary analyses of this gave values of 49 and 48.98 per cent of carbon and 5.69 and 5.74 per cent of hydrogen, with no nitrogen. Using the Rast camphor method, molecular weight determinations gave values of 1,070, 1,440, and 1,380, with an average of 1,297. The crystals which melted at 154° C. were inactive, but when the acetyl groups were split off by hydrolysis, the residues showed the same order of activity as the samples of hygroscopic Beta-bios before acetylation. Inosite appeared to be a component of Beta-bios, since it could be obtained from it by hydrolysis.

Studies on vitamin C noted briefly have been noted essentially from a recent paper by Eddy (E. S. R., 62, p. 607).

The vitamins, C. H. Best and E. W. McHenry (*Canad. Pub. Health Jour., 21 (1930), No. 3, pp. 119–131*).—In this lecture, presented at the annual meeting of the Canadian Public Health Association in Montreal in June, 1929, special attention is given to the history of vitamin deficiencies in Canada and to the vitamin problems of special interest to Canadian physicians. It is stated that the earliest record of vitamin deficiency in Canada dates from the year 1535 when the members of Cartier's expedition were afflicted with scurvy and some were cured almost miraculously by drinking a decoction made from the leaves and bark of white pine or spruce. In regard to present conditions in Canada, the following statement is made:

"It is very difficult to ascertain to what extent deficiency of the various vitamins prevails in Canada at the present time. There are undoubtedly great differences in different parts of the country. There are indications that steps are being taken which will give us information on these points. It is imperative that the vitamin content of Canadian foods be more fully investigated. We have relied too much in the past on the results obtained by scientists working in the United States with foods which may differ greatly in their vitamin content from those available in this country."

Synopsis of the anti-xerophthalmic, anti-neuritic, and anti-scorbutic vitamin percentages, besides the protein, fat, carbohydrate, and water amounts of different Indian foodstuffs, W. F. Donath (*Meded. Dienst Volksgezondh. Nederland. Indië, 18 (1929), No. 2, pp. 334–339*).—The vitamin values in the table presented are compiled from various papers of Jansen (E. S. R., 51, p. 370) and Jansen and Donath (E. S. R., 59, p. 492).

Vitamin D content of the liver oil of the dogfish, H. N. Brocklesby (*Canad. Chem. and Metall., 13 (1929), No. 3, pp. 74–77*).—The vitamin D potency of several samples of dogfish oil has been found to vary with the locality from less than 10 to about 30 per cent of that of a medicinal cod-liver oil bought on the open market. It is noted that these values are considerably higher than previously reported by Bills for dogfish liver oil (E. S. R., 57, p. 294).

In addition to the line test for measuring the amount of protection furnished by the oil, pH determinations of the feces were also made. These were considered of value in following the course of the disease, but not of quantitative significance in determining the potency of the oils being tested. In all cases there was a drop in pH following the administration of the oil, while in the controls there was usually an increase in pH, but the fall was not proportional to the potency of the oil.

Ultraviolet light and vitamin D in nutrition, K. Blunt and R. Cowan (*Chicago: Univ. Chicago Press, 1930, pp. XIII+229, figs. 39*).—This volume, which contains a foreword by M. Fishbein, summarizes in 14 chapters, each forming a more or less complete story in itself, the more important research dealing with ultra-violet light and vitamin D in relation to calcium and phosphorus metabolism. Each chapter has its own list of literature references, the whole forming a comprehensive bibliography. The treatment of the great mass of research in this field is sufficiently critical to make clear the distinction between well-substantiated facts and conclusions and tentative findings which should serve as a stimulus to further research and at the same time so readable as to appeal to lay readers as well as to research workers, physicians, and dietitians. Particularly timely are the chapters on tooth development and the antirachitic vitamin, in which a clear distinction is made between the effect of vitamin D and vitamin C; on the quantity and proportion of calcium and phosphorus in the diet, which deals with the question of the calcium-phosphorus ratio; on pregnancy and lactation, in which recent research on calcium and phosphorus metabolism during these periods is reviewed; on irradiated foods and irradiated ergosterol, in which the question of what food activation will do for the general health is discussed; on the effect of different foods on calcium and phosphorus metabolism, dealing particularly with the claim that cereals are anticalcifying substances; and the final chapter on some rickets surveys and demonstrations, in which is described the practical application of research findings in various clinics and hospitals.

Studies of the relation of vitamin D to the deposition of calcium in the bones of experimental animals, with special reference to the quantitative determination of vitamin D, H. K. Stiebeling (*Diss., Columbia Univ., New York, 1928, pp. 27, fig. 1*).—Essentially noted from another source (E. S. R., 62, p. 494).

Hypervitaminosis D: Calcium-phosphorus intake a determining factor, L. J. Harris (*Lancet [London], 1930, I, No. 5, p. 236*).—This is a brief preliminary report of observations indicating that the extent of hypercalcemia produced in rats by excessive dosage of vitamin D depends upon the calcium-phosphorus intake and probably upon the ratio of calcium to phosphorus. In the opinion of the author discrepancies in the results reported by various investigators of the problem of hypervitaminosis D are due to differences in the content of calcium and phosphorus in the diets used.

The irradiation of milk for the increasing of its antirachitic potency, D. Nabarro and J. O Hickman (*Lancet [London], 1930, I, No. 3, pp. 127–129*).—A method of irradiating milk without decreasing its vitamin A content through passing it in a thin film over a roller exposed to an ultra-violet lamp is described, and data are reported on the vitamin A and D content of the untreated and irradiated milk and on growth measurements of children receiving the irradiated milk after a period on the nonirradiated milk.

The untreated milk had very little antirachitic value, the best sample examined containing only 0.1 unit of vitamin D per cubic centimeter. Compared with this, the activity of the treated milk was increased nine times by an exposure of 8 seconds. An exposure of 30 seconds, the longest tested, was without effect on the vitamin A content of the milk. The children receiving the irradiated milk grew more rapidly than in the preceding period on the untreated milk.

Cereals and rickets.—III, The comparative rickets-producing properties of corn, wheat, and oats, and the effect of irradiation and mineral supplements, H. Steenbock, A. Black, and B. H. Thomas (*Jour. Biol. Chem., 85 (1930), No. 2, pp. 585–606*).—This extensive investigation of the rickets-producing effect of various cereals, certain phases of which have been noted in the first two papers of the series (E. S. R., 62, p. 898), is summarized as follows:

"The rickets-producing properties of corn, wheat, and rolled oats have been compared under various dietary régimes in which a total of 230 standardized rats was employed. These have been fed the various cereals, unsupplemented, supplemented with calcium carbonate, supplemented with phosphoric acid to equalize the total intake of phosphorus, and treated with the radiations of quartz mercury vapor lamps.

"In general, regardless of the calcium carbonate or phosphoric acid additions, the cereals ranked in antirachitic potency in the descending order of wheat, rolled oats, corn. With calcium carbonate supplementation, the addition of 1 per cent calcium carbonate produced the best bone. Small amounts of added phosphoric acid effected no appreciable change in bone composition. Irradiation corrected the difficulties in calcification encountered, and made the cereals approximately alike in antirachitic potency. Irradiated cereals produced heavier bone than the nonirradiated, but without calcium supplements the percentage of ash was not increased.

"Data are also presented which may account for the comparatively poor consumption of rolled oats by rats. The possible rôle of a vitamin A deficiency and indigestibility has been practically ruled out. Hydrochloric acid hydrolysis also effected no improvement. On the other hand, the data suggest that a deficiency of vitamin G and to a lesser extent vitamin B, or some other factor resident in yeast, caused the eventual decrease in food intake."

The action of irradiated ergosterol on rats and chickens, A. F. Hess and G. C. Supplee (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 6, pp. 609, 610*).—In this preliminary report of an investigation in which the authors had the cooperation of O. D. Dow, G. E. Flanigan, and O. J. Kahlenberg, data are summarized showing a striking difference between the action upon rats of irradiated ergosterol and cod-liver oil with regard to the content of inorganic phosphorus in the blood and the cure of rickets.

When inadequate doses of irradiated ergosterol were given in curative experiments, the inorganic phosphorus of the blood was raised to normal values, 6 mg. or more per 100 cc. of serum, but with no evidence of healing as judged by the line test and percentage of ash in the bones. When cod-liver oil in amounts of from 7 to 20 mg. daily was used in place of irradiated ergosterol marked healing followed and the bone ash increased, but the concentration of inorganic phosphorus in the blood did not rise above from 2 to 4 mg. per 100 cc. These results are thought to emphasize the fact that "the healing of rickets is not merely contingent upon a normal level of blood phosphate. It also shows the tendency of irradiated ergosterol to raise the phosphate concentration of the blood, quite apart from exciting any antirachitic or calcifying activity. When adequate amounts were added to the diet prompt and marked healing was brought about."

It is also noted that chickens differ from rats in their reaction to specific antirachitic substances, in that while they are regularly protected against leg weakness by the addition of 1 per cent of cod-liver oil to their ration, a supplement of irradiated ergosterol many times the equivalent of the cod-liver oil affords no protection. Under such conditions the ash of the bones is also comparatively low. On the contrary chickens have been found to respond rapidly to mild intensities of ultra-violet radiations and to show a high percentage of bone ash after such treatment.

Irradiated ergosterol. Maintenance of blood phosphate level in the course of development of rickets in infants, A. F. Hess, J. M. Lewis, and H. Rivkin (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 6, p. 611*).—Attention is called to a previous observation that the phenomenon, noted above, of increase in inorganic phosphorus of the blood with no signs of healing of the bones, in rachitic rats following treatment with subminimal doses of irradiated ergosterol also held true for infants receiving dried milk which had been inadequately irradiated (E. S. R., 62, p. 590). It has now been found that the infants receiving small amounts of a standard preparation of irradiated ergosterol, viosterol, during the winter reacted in a similar way.

It is noted again that irradiated foods and sterols have a tendency to raise the phosphorus content of the blood irrespective of their antirachitic action, and that consequently an analysis of the blood does not give reliable information as to the progress of the rachitic condition. "Under these conditions, information in regard to the presence of rickets can best be obtained by means of direct clinical examination or röntgenologic pictures."

Some differences in action between irradiated ergosterol and cod liver oil, A. F. HESS, M. WEINSTOCK, and H. RIVKIN (*Soc. Expt. Biol. and Med. Proc.*, *27* (*1930*), *No. 7, pp. 665, 666*).—Attention is called to the reports of Hess and Supplee and of Hess, Lewis, and Rivkin noted above, indicating that the action of irradiated ergosterol and cod-liver oil is not always comparable in chickens and in rats. A similar conclusion is now drawn with regard to infantile rickets. In an extended series of observations, it was found that 20 drops of a standard preparation of viosterol in some instances failed to protect infants, although the inorganic phosphorus concentration of the blood was maintained. In one instance a change to 6 teaspoonfuls of cod-liver oil daily brought about healing in a few weeks, although the viosterol which had failed to afford complete protection had been administered in amounts supposedly equivalent to 10 teaspoonfuls of cod-liver oil.

These results are thought to indicate not that the antirachitic action of irradiated ergosterol is weak or unreliable, but that the potency and dosage should not be referred to cod-liver oil as a standard. Inconsistencies between the action of the two substances are thought to be due possibly to the fact that irradiated ergosterol contains a phosphate-raising factor in addition to the antirachitic fraction. "However this may be, it would seem evident that the present method of standardizing irradiated ergosterol is unsound from a clinical point of view, as it is based on the assumption that the relative antirachitic potency of cod-liver oil and of irradiated ergosterol is the same in the rat and the infant, and that the units are interchangeable. Instead of an indirect method which computes activity on the basis of 'cod-liver oil units,' it would be better to determine the number of protective or curative 'rat units' and to use this direct determination as the basis of standardization."

A further report on the effect of thyroparathyroidectomy on the action of irradiated ergosterol, A. F. HESS, M. WEINSTOCK, and H. RIVKIN (*Soc. Expt. Biol. and Med. Proc.*, *27* (*1930*), *No. 4, pp. 298, 299*).—A further investigation of the possibility of inducing hypercalcemia by means of irradiated ergosterol in dogs after extirpation of the parathyroids and thyroids (E. S. R., 61, p. 596) has shown that with doses as high as from 100 to 800 times the therapeutic dose it is possible to induce definite hypercalcemia. It is thought that the source of the marked increase in serum calcium thus induced is the body tissues, more particularly the bones.

The distribution of ergosterol administered to rabbits, I. H. PAGE (*Soc. Expt. Biol. and Med. Proc.*, *27* (*1930*), *No. 4, pp. 314, 315*).—Using the Rosenheim color reaction for ergosterol (E. S. R., 61, p. 416) with the slight modification of low boiling dichloroethylene in place of chloroform as the solvent, the author has tested extracts prepared from various organs of adult rabbits which had been given large doses of Vigantol (irradiated ergosterol in oil) by means of the stomach tube.

The results showed a decided accumulation of ergosterol in the adrenals and brains, with small amounts in the liver and kidneys and almost none in the muscular organs. The amounts present, as estimated by the color reactions, were not proportional, however, to the amount of Vigantol fed.

Stone formation and diet, C. D. DE LANGEN (*Meded. Dienst Volksgezondh. Nederland. Indië*, *18* (*1929*), *No. 2, pp. 315–333, pl. 1*).—Data are reported on the occurrence of kidney, gall, and bladder stones in 10 rats on a vitamin A-free diet and 10 on a diet free from both vitamin A and protein. In the first group bladder stones were found in 4, kidney stones in 3, and gallstones in 2, and in the latter bladder stones in 7 and gall and kidney stones in 3 each. The extent of such concretions and of keratomalacia among the people of the Dutch East Indies is discussed. A relatively high proportion of both eye disease and bladder stones is attributed to dietary restrictions when suffering from the very prevalent diseases of the gastrointestinal tract. It is pointed out that in European countries during illness meat, fruit, and vegetables as a rule disappear from the diet and their place is taken by milk, while in the East Indies milk does not play a prominent part in the diet and the rice porridge which constitutes the greater part of the diet during illness is very lacking in vitamin A.

TEXTILES AND CLOTHING

The effect of heat and light on various types of rayon, B. Breckinridge, R. Edgar, and K. Cranor (*Jour. Home Econ., 22 (1930), No. 1, pp. 39–43, fig. 1*).—In the hope of obtaining information on the durability of the principal types of rayon now on the market, white celanese, viscose, and cuprammonium rayon fabrics as similar in yarn count and construction as possible were subjected to physical and chemical analyses before treatment and to breaking strength determinations after exposure to dry and to moist heat at different temperatures and for different lengths of time and to sunlight over a period of more than two months.

The celanese decreased more in breaking strength than the other fabrics, but showed less decrease in strength after exposure to dry heat. The dry strength of the celanese was affected less by light and the wet strength more than any of the other fabrics. Exposure to the sun for 10 weeks caused greater deterioration than exposure to dry heat at 120° C. for 50 hours, but less than exposure to moist heat at 120° for 50 hours.

Viscose was slightly more resistant to the effect of heat and sunlight than the other fabrics. When heated in the autoclave at 100 and 120° it had a greater breaking strength than any other specimens except the cuprammonium rayon exposed to moist heat for 50 hours at 120°. Dry heat caused only slight deterioration. After exposure to sunlight for 10 weeks the viscose ranked second in strength, both wet and dry.

Cuprammonium rayon was affected more than the other fabrics by dry heat, but not to any extreme degree. The greatest loss, a little more than one-third of the original strength, occurred after heating in the autoclave at 120° for 50 hours. Exposure to sunlight for 10 weeks decreased the breaking strength more than dry heat at 120°.

The loss in weight due to exposure to dry heat was least in the celanese. The cuprammonium rayon and viscose turned very yellow after 40 hours of heating at either 100 or 120°. The color of the celanese was not affected. From the results of these tests it is thought that a reasonable amount of heat could be used on any of these rayon fabrics in pressing without injuring them appreciably.

An investigation of some of the fabrics used in the manufacture of underclothing, C. E. Snelling and A. Brown (*Amer. Jour. Diseases Children, 39 (1930), No. 1, pp. 9–17*).—This paper reports useful information concerning various types of fabrics used in the manufacture of infants' underclothing, the points considered including power of heat retention, moisture absorption and loss, porosity, skin irritation, cleansing, strength and durability, and relative cost.

Clothing for women, L. I. Baldt (*Philadelphia and London: J. B. Lippincott Co., 1929, pp. VII+552, pls. 9, figs. 367*).—A new edition of the volume previously noted (E. S. R., 53, p. 398).

HOME MANAGEMENT AND EQUIPMENT

The routine and seasonal work of Nebraska farm women, M. R. Clark and G. Gray (*Nebraska Sta. Bul. 238 (1930), pp. 39, figs. 9*).—The data presented were secured during 1927 and 1928 from 179 farm home makers in 18 counties, who kept records and filled in questionnaires. Tables and charts are given showing the size of farm, baking done, homes with modern conveniences, fuel used, income from labor, and membership in organizations of different types; and variations, by months, in the average number of persons and rooms of different kinds used per farm, different types of sewing and canning, butter making, caring for milk, meals served, chickens cared for, garden tasks done, help received from others, assistance in outside farm work, days of illness of self and others, and time spent away from home.

Thermal efficiencies of aluminum saucepans, C. Landreth and R. O. Hutchinson (*Jour. Home Econ., 21 (1929), No. 8, pp. 599–604*).—This comparison at the Washington Experiment Station of the relative merits of heavy so-called " waterless " aluminum ware and the lighter weight, less expensive aluminum utensils was based on the rate of heating, retention of heat both on and off the stove, percentage of water evaporated during the cooking process, and durability and cost of the utensils. The tests were carried out on an electric stove with five well-constructed aluminum kettles of approximately the same capacity, but varying in weight from 364.3 gm. to 963 gm. and in cost from $1.35 to $7.60.

The thermal efficiencies of well-constructed light and heavy utensils proved to be approximately the same, the extent of evaporation of water from the kettles depending upon a well-fitting lid rather than upon the weight of the kettle. It was found that cooking processes requiring a temperature of approximately 98° C. for 30 minutes could be accomplished on the heat stored in the electric unit after the boiling point had been reached. It was concluded that "'waterless cooking' or the cooking of vegetables in a minimum amount of water may be accomplished in either a light or heavy kettle, provided the lid is a well-fitting one and only sufficient heat is supplied from the heating unit to maintain the desired temperature."

MISCELLANEOUS

Report of the Hawaii Agricultural Experiment Station, 1929, J. M. Westgate et al. (*Hawaii Sta. Rpt. 1929, pp. [2]+34, figs. 9*).—This contains the organization list, a summary by the director as to the work of the year, and reports of the divisions of horticulture, chemistry, and agronomy, the extension and demonstration work, boys' and girls' club work, and the Haleakala Substation. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Agricultural experiments, 1929: Report of the New Hampshire Agricultural Experiment Station, J. C. Kendall (*New Hampshire Sta. Bul. 250 (1930), pp. 31, figs. 5*).—This contains the organization list, a report of the director on the work of the station, and a financial statement for the fiscal year ended June 30, 1929. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report [of Washington College Station], 1929, E. C. Johnson et al. (*Washington Col. Sta. Bul. 237 (1929), pp. 66*).—This contains the organization list, a report on the work of the station, and a financial statement for the fiscal year ended June 30, 1929. The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES

Connecticut State Station.—Dr. L. B. Mendel of Yale University has been appointed to the station staff with the title of research associate in biochemistry, the board of control thereby recognizing officially a relationship that through his collaboration with the late T. B. Osborne and his successors has existed for many years.

Dr. W. E. Britton, State and station entomologist, was granted the honorary degree of doctor of science on June 16 from the University of New Hampshire.

Cornell University and Station.—The departments of rural engineering and vegetable gardening have been rechristened the departments of agricultural engineering and vegetable crops. A course in research methods has been added in farm management.

M. L. Holmes, professor of business management; Drs. H. J. Metzger and C. L. Allen, extension assistant professors of animal husbandry; Dr. R. D. Lewis, extension assistant professor of plant breeding; and Dr. R. W. Nafe, research assistant professor of rural social organization, have resigned. Leave of absence for the ensuing year has been granted to C. H. Guise, assistant professor of forest management; Dr. G. F. Warren, head of the department of agricultural economics and farm management; Dr. V. B. Hart, extension professor of farm management; Dr. B. L. Melvin, acting professor, and R. A. Felton, extension professor of rural social organization; L. E. Weaver, extension assistant professor of poultry husbandry; Dr. Robert Matheson, professor of economic entomology; H. C. Troy, professor of dairy industry; and Dr. J. K. Wilson, professor of soil technology.

Recent appointments include Sidney Arthur Asdell as assistant professor of animal husbandry, Whiton Powell as professor of business management in the department of agricultural economics, and Carl Edward Frederick Guterman as assistant professor of plant pathology research.

Pennsylvania College and Station.—The department of agricultural biochemistry has purchased a complete experimental milling and baking outfit and is instituting studies of the kinds and quality of the wheats grown in the State.

The title of the department of farm machinery has been changed to that of agricultural engineering.

The resignations are noted of Dr. Hannah E. Honeywell, associate professor of biological chemistry, effective June 30; R. P. Tittsler, assistant professor of bacteriology, effective September 1; Dr. Illo Hein, assistant professor of botany; E. M. Funk, assistant professor of poultry husbandry, effective July 31; J. O. Pepper, assistant professor of entomology extension; and J. T. Vandenburg, assistant in agricultural economics. Recent appointments include Dr. N. B. Guerrant, research associate professor of animal nutrition in the Alabama Station, as assistant professor of biological chemistry, effective August 1; William T. Henerey as assistant professor of entomology extension; Dean R. Marble as assistant professor of poultry husbandry; Clifford O. Jensen as assistant in agricultural and biological chemistry; P. H. Margolf as assistant in poultry husbandry; and W. S. Clarke, jr., as assistant in pomology.

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EXPERIMENT STATION RECORD

Vol. 63 September, 1930 No. 4

Under the title of Vocational Education in Agriculture a somewhat unusual publication of nearly 250 pages has recently become available, in which this subject is viewed on a world basis through the eyes of Labor. It embodies a survey and discussion of the status of vocational education in agriculture in 32 countries of Europe, Latin America, Asia, and the Antipodes. This study was made by the International Labor Office of the League of Nations at Geneva, Switzerland. The report (E. S. R., 63, p. 88) was published in London, and it is being distributed in the United States by the World Peace Foundation.

The interest of the International Labor Office in agricultural education has been manifested in various ways since its organization. In 1921 a general conference of the International Labor Organization of the League of Nations submitted a recommendation to the Governments represented therein that vocational education be developed and made available to agricultural wage earners on the same conditions as to other persons engaged in agriculture and that regular reports be made by its members to the International Labor Office containing as full information as possible. By 1929 this recommendation had been formally accepted by 17 countries.

At the 1921 conference an advisory agricultural committee was also decided upon, and eventually this committee was set up with a membership drawn equally from the International Labor Office and the International Institute of Agriculture. Subsequently this committee was presented with a suggested questionnaire drawn up by the International Labor Office to be circulated among the Governments of the world in the hope of obtaining "such body of information on vocational education in agriculture as would enable fresh light to be thrown on this subject and would be of assistance to authorities interested in improving or initiating opportunities of vocational education for rural populations." This questionnaire was ultimately approved with modifications, and in 1924 it was sent to all Governments holding membership in the International Labor Organization and also through the agency of the International Institute of Agriculture to the United States and to Russia. Replies

In conclusion the report considers the position of the individual farmer as affected by a general increase in gross production. It admits that "the rate of modern scientific discovery is entirely unrelated to economic demands, and no sort of attempt is made to control its pace from that point of view either in agriculture or in any other industry," and acknowledges that "the scientific impulse is too important a feature of the modern attitude to life to consent to be subservient to industrial limitation; such limitations can never be interesting to the scientist, who exists in order to break through them."

Moreover, as the report makes plain, "far more influential than the scientist's point of view is that of the consumer. There is so just a demand on the part of consuming populations, especially working-class populations, for more and for better quality of food that it is inconceivable that any suggestion to limit supply would be listened to. Society claims, and rightly claims, the largest and the best agricultural production from those who are in monopolistic occupation of what is normally estimated to be the most important form of national wealth, the land. Thus the cry is for larger and larger production, and public moneys for vocational agricultural education are gladly voted as a means to that end."

Meanwhile, the immediate concern of the farmer, it is made clear, is to earn his living. "In accepting vocational agricultural education as an assistance to his career, his objective is to learn to produce, not the largest amount physically possible from his land, but more than his competitors produce at the same cost from an equal area. But if the result of vocational agricultural education is simply to increase gross production, and if the services of the State on a great scale have been evoked in order to get those results over as wide an area as possible, it is not certain that the financial (as apart from the ultimate economic) advantages of agricultural improvements will be anything but short-lived or that they will fall into the pocket of any but the very wide-awake farmer.

"If we apply the same argument on a larger scale, all that can be said is that the community which at present can apply the results of scientific discovery rapidly to its agriculture is in a fair way to be saved, as Denmark was saved in the nineteenth century by adopting what were at that time revolutionary methods. But the effects of a combined application by a large number of countries of any particular improvement might be quite different.

"We appear almost to have arrived at a reductio ad absurdum. Want of agricultural prosperity has of late years been a definite stimulus to agricultural populations to seek more technical knowledge; a farming industry which is expanding will quickly absorb all the younger generation, trained or untrained; an 'extractive' agriculture neglects training because it is making money anyway. It is usually when farming is unprosperous that it will go through the expensive process of seeking more knowledge. But if knowledge defeats its own ends, what of it?

"Three considerations apply in answer to this argument. In the first place, the mere removal of the reproach of inefficiency from agriculture would be an advantage. Society has the right to demand the highest standards of efficiency from those who are in occupation of the cultivable areas of the earth; it can scarcely be said that those highest standards have been reached or that the reproach of inefficiency is not frequently a just one. To remove it is important, for it is unlikely that agriculture will receive adequate consideration from those who guide public policy until that has been done. From this point of view alone vocational agricultural education is worth while.

"In the second place, the objective of vocational agricultural education might be not so much a larger volume of production as better production, and especially specialized production. There will be for years to come an always expanding market for 'quality' products. Here the interests of the industrial working classes so notably coincide with those of the agricultural producer that a fundamental reconciliation is possible. It is essential that the industrial working classes should consume more milk, butter, meat, fruit, etc. Such produce ought to be saleable for many years at prices which pay the agriculturist—if he is capable of producing them skillfully and easily. Here vocational agricultural education is the way and the means.

"But even supposing that this avenue failed, that the same situation appeared in regard to these products as at present depresses the prices of cereals, namely, shrinkage of buying (as distinct from consuming) capacity in relation to growing production, could not the basic principle of vocational agricultural education then be applied to deal with the agricultural economic situation itself? Or must the advocates of such education drift helplessly towards an unmanageable volume of production without feeling themselves responsible for advising and training the agriculturist to deal with this all important side of life? It is clear that the conception of vocational agricultural education needs to be enlarged so as to deal with farming as a business and not only as a science."

The report then goes on to indicate the considerable efforts already being made in the direction of economic and sociological research in various countries, including the United States. Special importance, it is stated, attaches to the experimental institutes at Pommritz in Saxony and Uhrineves in Czechoslovakia, which deal with labor questions, "as these are the only examples of actual experimental work which has an immediate bearing on the economic side of agriculture.

"It will be the business of the vocational agricultural education systems to take over the results of this economic inquiry work and to show the farmer how to apply it. No system of education, of course, will transfer the farmer's personal responsibility away from himself; he can but profit to the best of his ability by the training he receives. But to offer that training in the economic field, as it has hitherto been offered in the scientific field, is perhaps the biggest task which now confronts agriculture, and it may be declared fortunate that the mechanism of vocational agricultural education has got itself so firmly established in a large number of countries and has so gained the confidence of the farming world now that this effort will clearly be required of it. It is hardly possible to exaggerate the importance of this future development of vocational agricultural education, if it is handled energetically."

As its final word, however, the report declares that "the fact should be frankly faced that an increase in efficiency will possibly mean a decrease in the number of persons able to live by carrying on agriculture or possibly some particular branch of agriculture. Already the increase of efficiency in sugar production has led to such a situation. In spite of the enormous possibilities of increased consumption of agricultural products, there may be a progressive shrinkage of the proportion of populations to be occupied in agriculture. Yet nothing could justify neglect of education as a step towards efficiency merely in order to retard this shrinkage. On the contrary, education is the one good means open to the agricultural population to enable them to surmount a crisis, which, with the introduction, e. g., of more and more machinery, of scientific management, etc., into agriculture, may prove almost as severe as was the industrial revolution for other industries."

The author of this discussion is not revealed, but his views contain much that is worthy of thoughtful consideration. While of course not entirely novel and in no sense revolutionary, the fact that they are published under the sponsorship of a great international labor group gives them added significance and importance. For these and other reasons the report is a somewhat notable and timely contribution, deserving of meditative contemplation by all who are interested in the betterment of agriculture and especially by those concerned in the promotion of its cause by public funds.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The biological decomposition of plant materials, I, II, A. G. Norman (*Biochem. Jour., 23 (1929), No. 6, pp. 1353–1384, figs. 8*).—The series represented by these two papers is a contribution from the Rothamsted Experimental Station.

I. *The nature and quantity of the furfuraldehyde-yielding substances in straws* (pp. 1353–1366).—Values for the pentosan content of straws and similar materials obtained, as were those of Waksman and Tenney (E. S. R., 59, p. 719) and others, by employing the Kröber factor on the total furfuraldehyde yield figures, "are unreliable because of the uronic and hexose groups in the hemicelluloses, and the furfuraldehye-yielding groups intimately associated with the Cross and Bevan cellulose fraction. If an adjustment is made for these and for the pectin present, it is possible to obtain a satisfactory figure for furfuraldehyde due only to the pentose units of the hemicelluloses. An approximation for the actual content of hemicelluloses in the material may then be obtained by determining the furfuraldehyde yield from the pentose groups in a mixed hemicellulose product obtained by alkaline extraction."

Various data obtained in the approximate analyses of oat straw and rye straw, and computed on the basis of the considerations above noted, are given.

II. *The rôle of the furfuraldehyde-yielding substances in the decomposition of straws* (pp. 1367–1384).—Report is made of experiments on the decomposition of various straws "under optimum conditions by a mixed natural flora in the presence of sufficient available nitrogen," in which the course of the decomposition was followed by means of frequent and detailed analyses, special attention again having been given, as in the preliminary work above noted, to the various types of substances yielding furfural.

"The hemicelluloses appear to decompose very rapidly in the first few days, and then to remain at much the same level while the cellulose is still decreasing. This is presumably due to the fact that as hemicelluloses are chemically nonhomogeneous, their biological availability may vary very considerably, differing in this from unlignified cellulose. Two reasons may be advanced for the early loss of hemicellulose. Firstly, as they are encrusting substances on the cell wall, they must need to be removed, in part at least, before the cellulose can be attacked. In the second place, some hemicelluloses or some component groups of the hemicellulose molecule are easily available, and these together with the soluble plant substances must play an important part in promoting the rapid multiplication of the organism. The xylan associated with the Cross and Bevan cellulose fraction in this straw is not unavailable, but is removed only slowly, the rate presumably being controlled by the loss of the cellulose with which it is in such intimate association.

"There is definite evidence for the production of some intermediary substance which yields furfuraldehyde. That this is produced transitionally in the degradation of the cellulose is probable, though the support for this theory is scanty. The extent of the production of this substance is difficult to assess. The loss of uronic acid from the straw is steady but small, and not paralleled by the apparent loss of hemicellulose. It seems likely that the uronic group is biologically less available, and that the residual hemicelluloses must contain intermediate degradation compounds of uronic content above normal. The small amount of pectin present does not seem to be removed during normal decomposition, but only if acid conditions set in. There is some evidence that there is even a synthesis of pectin, or of some compound estimated as pectin. Subject to structural and physical variations, it is agreed that the decomposition of plant materials in the presence of assimilable nitrogen is favored by the food or energy factor, and retarded by the resistant factor. The food or energy factor must be regarded as being composed in mature materials of cellulose together with the available hemicelluloses, and the resistant factor as being the lignin fraction."

The degradation of wood by simultaneous action of ethyl alcohol and hydrochloric acid, W. G. CAMPBELL (*Biochem. Jour., 23 (1929), No. 6, pp. 1225–1232*).—A detailed study was made of the simultaneous effect upon the wood of Sitka spruce of ethyl alcohol and hydrochloric acid. The experimental results stated led to the conclusion "that at least two main reactions are involved, namely, hydrolysis of carbohydrates, influenced by the presence of alcohol, and action of alcohol on lignin in the presence of hydrochloric acid." The maximum effect on the lignin of the wood was obtained by the treatment of oven-dried material "with a concentrated solution of hydrogen chloride in absolute alcohol, the necessary water being formed by interaction of the acid and alcohol." The experimental evidence given is considered to support the view "that the association of lignin and cellulose in wood is of a physical rather than a chemical nature."

[Vegetable protein report of the Connecticut State Station], L. B. MENDEL and H. B. VICKERY (*Carnegie Inst. Wash. Yearbook 28 (1928–29), pp. 372–375*).—Work carried out at the Connecticut State Experiment Station and largely noted from other sources (E. S. R., 60, p. 414; also page 309) is here briefly summarized.

Experiments on protein decomposition.—I, On the evolution of nitrogen from proteins under the action of sodium hypobromite, and the relation of this reaction to the arginine content [trans. title], O. FÜRTH (*Biochem. Ztschr., 220 (1930), No. 1–3, pp. 69–81, fig. 1*).—The protein preparations casein, gelatin, legumin, edestin, oryzanin, and zein were found, on treatment with alkaline hypobromite solutions, to evolve nitrogen in two distinct stages. In one, at least, of the groups of experiments reported, a relatively rapid evolution of nitrogen took place during the first 10 to 20 minutes, in amount approximating one-half the arginine nitrogen. This stage was followed by an inactivity of an hour or less, after which a second period of decidedly slower nitrogen evolution began.

Acetamide, the amide groups of asparagine, tryptophane, and the acyclic monoamino acids yielded practically no nitrogen when treated with the alkaline hypobromite. Lysine, on the other hand, and histidine gave off more than half their nitrogen. The secondary reaction is considered obviously referable to the nonpolypeptide nitrogen, this stage of the general action being attributed primarily to the free amino groups of the lysine and to a lesser extent to the decomposition of the histidine. The possibility that the end amino groups of polypeptides and diketopiperazines may take part in the reaction is also considered.

A note on ammonium creatinine picrate and its possible use in the preparation of creatinine, I. GREENWALD (*Jour. Biol. Chem., 81 (1929), No. 1, pp. 73–75*).—"Apparently, ammonium creatinine picrate has a real existence, but because of its ready dissociation into its components and because its molar solubility is almost exactly that of creatinine picrate, though less than that of ammonium picrate, it is difficult to obtain in a pure condition. The formation of this ammonium creatinine picrate may be used to advantage in increasing the yield of creatinine obtained from creatine. The ammoniacal filtrate is evaporated in vacuo, with a bath temperature of not over 40°, to about one-half its volume. . . . Two equivalents of technical picric acid for each equivalent of creatinine expected are dissolved in hot water. The evaporated solution is added, and the mixture is allowed to cool. The crystals are filtered, pressed out, and washed with a little water. The yield is practically quantitative."

The use of this method to avoid the losses—about 20 per cent of the theoretical yield—usually occurring in the preparation of creatinine from creatine is recommended, the free base being obtained by first extracting the picrate strongly acidified with hydrochloric acid by means of benzene in a continuous extractor, then crystallizing the chloride, and treating the cold paste or crystals with cold ammonium hydroxide solution. The creatinine, which was found obtainable snow-white by the procedure, is directed to be filtered off at 0° C. and washed at the same temperature with ammonium hydroxide and then with methyl alcohol.

The behavior of cystine with silver salts, H. B. VICKERY and C. S. LEAVENWORTH (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 129–143*).—It was shown in this research of the Connecticut State Experiment Station that cystine, when dissolved in dilute sulfuric acid and treated with an excess of silver sulfate, yields, on neutralization of the solution to pH 6, a precipitate containing from 70 to 85 per cent of the nitrogen of the cystine taken and consisting in large part of the cysteine compound $(C_3H_6NSO_2Ag)_2 \cdot Ag_2\,So_4$. The color reactions of this compound indicated that it is a silver mercaptide derivative of cysteine. An extensive reduction occurring during its formation was accompanied by an oxidation that resulted in the production of a mixture of substances, among which ammonia and cysteic acid were identified. Insignificant amounts of cystine appeared in the filtrate from the precipitate.

"The existence of this silver compound accounts for the presence of cystine and cysteine in the histidine fractions secured during the basic amino acid analysis of proteins by silver precipitation methods."

Compound formation of crystal violet with nucleic acid and gelatin and its significance in dye bacteriostasis, A. E. STEARN (*Jour. Bact., 19 (1930), No. 2, pp. 133–143*).—The principle of the experimental method used is thus indicated: "If the conductivity of the crystal violet ion in one solution is known and that of nucleate ion or gelatinate ion in another solution is known, then, if known volumes of these solutions are mixed, the conductivity of the mixture should be easily calculable provided no combination between any of the ions has taken place. A decrease in conductivity from that calculated would indicate such combination."

The results are considered "dictinctly confirmatory of a chemical mechanism for this type of bacteriostasis, unless it be argued that the properties of gelatin and of yeast nucleic acid are highly specific and do not represent general behavior." As opposed to mutual colloidal flocculation as the cause of the observed decreases in conductivity are noted the two further observations (1) that the conductivity decreases were of the same order of magnitude whether the precipitation took place or not, and (2) that "the pH change when dye and nucleic acid or gelatin solutions are mixed is a typical chemical replacement reaction."

Note on the acetyl derivatives of thyroxine, J. N. Ashley and C. R. Harington (*Biochem. Jour.*, *23* (*1929*), *No. 6*, *pp. 1178–1181*).—By treating thyroxine in alkaline alcoholic solution with acetic anhydride and allowing the reaction mixture to stand 30 minutes, then acidifying and distilling off the alcohol, the authors were able simultaneously to acetylate and esterify the thyroxine, a procedure yielding the ethyl ester of diacetylthyroxine.

Phenylalanine also yielded under like conditions the ethyl ester of its acetyl derivative; and the statement is made that "it appears, therefore, that the reaction is a general one, and there can be little doubt but that it proceeds through the stage of the azlactone."

The preparation of *N*-acetylthyroxine methyl ester and of *N*-acetylthyroxine is also described.

A study of the polysaccharides, I, II (*Roy. Dublin Soc. Sci. Proc.*, *n. ser.*, *19* (*1930*), *Nos. 33*, *pp. 409–414*, *figs. 2*; *38*, *pp. 451–453*, *fig. 1*).—These two introductory papers deal with some modifications of method and with the preliminary study of some inulin derivatives.

I. *Inulin and inulan*, J. Reilly and P. P. Donovan.—A highly purified preparation of inulin, ash content 0.05 per cent and $[\alpha]^{20} = -31.2°$, yielded a lower polymer of a molecular weight corresponding to $(C_6H_{10}O_5)_2$ and here designated inulan, on solution in molten acetamide and subjection for two hours to a temperature of 90° C., the inulan having been found precipitable by absolute alcohol. When the dimeric inulan was dissolved in water, thrown out with alcohol and again examined, the molecular weight, determined as before by the depression of the freezing point of water, was found to represent polymerization to the aggregates $(C_6H_{10}O_5)_{15}$ and $(C_6H_{10}O_5)_{16}$. Inulin itself, similarly purified by solution in water and precipitation with alcohol, gave values for molecular weight corresponding to the 7- and to the 8-member polymers. The specific rotation of the inulan was found identical with that of the higher inulin polymers. "The results arrived at in this work point to the view that the structural unit of inulin may be the difructose anhydride molecule $(C_6H_{10}O_5)_2$. It seems probable that the dimer anhydride is linked up internally by ordinary structural valency, and that the aggregate molecule is then formed by the exercise of the coordinate covalencies of the oxygen atoms in coordinating with the hydrogen atoms of the hydroxyl groups. The fact that the specific rotary power is identical in each case points strongly to the conclusion that the aggregation is not due to an open chain structural linking—which would be expected to introduce a constitutive effect—but rather to the residual valency linking."

II. *Note on the purification of the natural products*, J. Reilly and D. T. McSweeney.—A simple form of 3-cell electrodialyzer assembly is described and illustrated. Two concentric glass cylinders, over the botoms of which were tied the parchment membranes used, constitute the essential feature of the apparatus. Platinum electrodes were placed within the inner cylinder and below the membrane of the outer. The apparatus served successfully for the purification of various carbohydrate preparations.

Studies on dextrins, I, II (*Jour. Indian Inst. Sci.*, *13A* (*1930*), *No. 4*, *pp. 31–41*).—The two papers here noted form the first report on an investigation into the nature and composition of dextrins produced by a number of enzyme preparations of local origin.

I. *Action of amylase from cholam* (*Sorghum vulgare*) *on potato starch*, V. N. Patwardhan (pp. 31–37).—From the products of hydrolysis of potato starch were isolated four dextrins, of which the reducing powers and specific rotations were determined. The dextrins were found hydrolyzable by the enzymes isolated either from malted or from ungerminated cholam. The extracts of the ungerminated cholam attacked the dextrins more readily, however, and carried the hydrolysis farther than did those of the malted grain.

II. *Amylase from ragi* (*Eleusine coracana*), V. N. Patwardhan and N. Narayana (pp. 38–41).—The ragi enzyme was found to have a saccharifying power greater than that of the corresponding enzymes from cholam malt or from maize malt, but less than that of barley malt amylase. The optimum temperature was between 55 and 60° C. The enzyme was less liable to destruction by higher temperatures than the cholam enzyme. The optimum reaction range observed was pH 4.86 to pH. 5.07. There was no evidence of the occurrence with the enzyme of a thermostable amylase complement.

On the nonidentity with insulin of the insulin-like substance of yeast [trans. title], A. Boivin (*Bul. Soc. Chim. Biol.*, *12* (*1930*), *No. 2*, *pp. 244–252*).—From a comparison of the constituent chemical groups found and from other properties studied the author concludes definitely that the two substances named are chemically distinct.

On the inner adsorption in crystalline salts [trans. title], D. Balarew (*Kolloidchem. Beihefte*, *30* (*1930*), *No. 8–12*, *pp. 249–296*, *figs. 14*).—The question of the inclusion by inner adsorption of various salts in crystalline precipitates is treated, both in its theoretical and its practical relations, as an important problem of capillary chemistry. Typical, thoroughly investigated cases of the retention of impurities, such, for example, as that presented by the precipitation of barium sulfate, were considered. On the basis of the Gibbs-Ostwald-Freundlich equation for the dependence of the surface tension upon the radius of the particle and on the basis of other theoretical considerations concerning surface tension, the composition of highly disperse crystalline particles, the smallest dimensions of a particle capable of serving as a crystallization nucleus, etc., were planned experiments for testing the possibility of inner adsorption and a mosaic structure (Mosaikstruktur) of the crystals as actually formed, by a study of the course of crystal growth.

Characteristic properties of adsorption layers inclosed in the inner structure of crystals are stated to have been determined. The precipitation of zinc sulfide with copper sulfide was found to parallel in every respect the adsorptions taking place in the crystallization of barium sulfate precipitates and adsorption following the Paneth-Fajans rule. The system $NH_4Cl{\cdot}FeCl_3{\cdot}aq$ showed many analogies with that of the impure barium sulfate system.

Hydrogen-ion activity in dispersions and colloid disperse systems [trans. title], H. Pallmann (*Kolloidchem. Beihefte*, *30* (*1930*), *No. 8–12*, *pp. 334–405*, *figs. 21*).—In the electrometric or inversometric determination of the H-ion concentration in disperse systems it was found that in general a suspension showed an H-ion concentration different from that of the dispersion medium. Suspensions of acidic systems usually showed a reaction more acid than that of the dispersion medium, alkaline systems a reaction more alkaline than that of the dispersion medium. The quantitative relations were, up to moderately high concentrations of the suspended material, the simple linear dependence

$$C_H' = C_H^0 + K\cdot x \quad \text{and} \quad C_{OH}' = C_{OH}^0 + K'\cdot x,$$

for acid and for alkaline systems, respectively, wherein C_H' is the apparent H-ion concentration of the system, C_H^0 the H-ion concentration of the dispersion medium, K a constant of proportionality, and x the concentration of the disperse phase in unit volume. At higher concentrations of the disperse phase the effect of the suspension concentration became proportionally less, however.

Numerous further findings and conclusions are also recorded. The paper, which amounts practically to a small monograph, includes an introduction; an experimental part in which are taken up the topics electrometric measurements, inversometric measurements, ion exchange, electrometric potential, and suspension effect; a theoretical part; and a summary.

The thiol-disulphide system.—I, Complexes of thiol-acids with iron, R. K. CANNAN and G. M. RICHARDSON (*Biochem. Jour., 23 (1929), No. 6, pp. 1242–1262, figs. 4*).—Report is made of a preliminary study of the rate of the spontaneous autoreduction of some ferrithiol complexes to the corresponding ferrothiol complex, and of the relation to this reaction of the H-ion concentration. "The equilibrium potentials of the system have been determined, and an electrode equation has been established which defines the electrode behavior within a limited range of pH and concentration of thiol acid." Also, "arising out of these studies certain suggestions have been made as to the nature of the complexes. These have been elaborated to a tentative structural description of the various equilibria of importance in the system thiol acid-iron."

A description of the glass electrode and its use in measuring hydrogen ion concentration, A. E. MIRSKY and M. L. ANSON (*Jour. Biol. Chem., 81 (1929), No. 3, pp. 581–587, figs. 2*).—The authors of this contribution from The Rockefeller Institute for Medical Research describe the construction and use of a glass electrode considered easier to make than some previous forms of this device. Quartz is substituted for amber insulation. The switch used "combines speed of change of contact with ample insulation," and contact with the potassium chloride bridge solution is established through an agar tip, more convenient and less bulky in the opinion of the authors than a ground glass joint.

"The P. D. [potential difference] of the glass electrode is measured first when it contains a solution of known pH (e. g. 0.05 M potassium hydrogen phthalate). The pH is observed again when the solution of unknown pH is added to the cup of the electrode. From the two, the unknown pH can be calculated." It is further stated that "to clean the electrode after a measurement has been made, all that it is usually necessarry to do is to rinse the small bulb and agar tip with a stream of distilled water. It takes about 1 minute to make a measurement."

A comparison of the quinhydrone and hydrogen electrodes in solutions containing tannin, E. L. WALLACE and J. BEEK, JR. ([*U. S.*] *Bur. Standards Jour. Research, 4 (1930), No. 6, pp. 737–745, pl. 1, figs. 9*).—Poisoning of the electrodes by copper was prevented by the addition of potassium ferricyanide in a small quantity sufficient to precipitate the copper ion. Chestnut and quebracho extracts and mixtures of these in equal parts were studied, together with water extracts of leathers tanned with such materials and with extracts containing small added quantities of sulfuric acid.

It was found that the quinhydrone and the hydrogen electrodes did not give closely agreeing results in any of the systems studied. "At particular points the two electrodes give the same values, but the results obtained with quinhydrone could not, in general, be substituted without correction for those obtained with hydrogen." The quinhydrone correction curves showed so wide a variation that "no attempt has been made to formulate a general expression for this correction." It is considered, however, that "the experimental results indicate that quinhydrone electrode readings for the pH of leather water systems can be corrected to correspond with hydrogen electrode readings in case the exact nature of the solutions in question is known," and such corrections were, in fact, successfully used. "In the case of tanning extracts the errors involved are too great to be disregarded."

A gas analysis pipette for difficult absorptions, M. SHEPHERD ([*U. S.*] *Bur. Standards Jour. Research, 4 (1930), No. 6, pp. 747–752, figs. 2*).—The essential feature of the device described and illustrated is a thin plate of platinum perforated with 200 holes 0.06 mm. in diameter. Passing through this distributor the influent gas is mixed intimately with the absorbing liquid, with the result that oxygen, for example, is completely removed from a sample of air by three passages through the plate pipette charged with alkaline pyrogallol, as against 10 passages required to effect a like absorption in the pipette of the ordinary design. The Dennis-Friedrichs apparatus was found of a like effectiveness; but the new form of pipette was cheaper, simpler, less fragile, and did not require special molds for its construction.

The use of copper sulphate as a substitute for mercury in the Kjeldahl digestion [trans. title], F. MACH and W. LEPPER (*Landw. Vers. Sta., 109 (1929), No. 5–6, pp. 363–366*).—The decomposition of feeding stuffs in the Kjeldahl method with the use of copper sulfate was completed in the same time as was that obtained by means of mercury added either as metal or as sulfate, and the same figures were obtained. Adding the potassium sulfate at the beginning of the digestion was found generally desirable, as was also the use of a small flame at the beginning of the heating, a precaution considered necessary especially with large samples to prevent loss during the period of vigorous gas evolution. Graphite dust was used in preference to zinc as a means of preventing bumping during distillation, to avoid the possible reduction of nitrates present in the alkali.

A micro method for the determination of mercury in organic compounds [trans. title], J. J. RUTGERS (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 12, pp. 746–748*).—In principle the procedure noted consists in the burning of the sample in an open tube in a current of oxygen carrying vapors of aqua regia. The mercury was found to be converted in this process from organic combination into mercuric chloride, and was weighed as the free metal deposited from the solution of the chloride by electrolysis.

Soil moisture determination by the alcohol method, A. SMITH and F. W. FLINT (*Soil Sci., 29 (1930), No. 2, pp. 101–107*).—The experiments reported in this contribution from the University of California consisted essentially in the comparison, through the examination of a series of soil samples of widely different properties and composition, of the Bouyoucos absolute methyl alcohol method (E. S. R., 59, p. 113) with the oven-drying method for the determination of soil moisture. Both ethyl and methyl alcohols were used in these trials. The samples included sands, fine sandy loams, and clays representing the Yolo, Columbia, San Joaquin, and Sacramento series, together with the clay adobe, and the clay loam of the Capay series. Both soils in their natural condition as they were found in the field and samples "dried and then either moistened with distilled water or used in the air-dry condition" were examined. Among technical details the time factor, the extent of the stirring, and the effect of soluble salts and of saline or "alkali" soils were taken into consideration.

"With the coarser textured soils, close agreement was usually obtained between the alcohol method and the oven-drying method. In the case of most fine-textured soils the agreement was not close, as it was impossible to obtain a thorough mixing of the alcohol and soil within a few minutes. When the fine-textured soils (clays) were vigorously stirred for 30 minutes, the results obtained for their moisture content by the two methods agreed closely. The variation of the composition of the soil solution and amount of alkali salts present affected the accuracy of the alcohol method, the greater density of solution from the alkali soils necessitating a restandardization of the hydrometer.

"The actual amount of the operator's time required to determine the soil moisture content by the alcohol method in the case of coarse-textured soils was three times as great, and with the fine-textured soils five or more times as great, as by the oven-drying method. This does not include the time when the samples were being dried in the oven, as this did not require any of the operator's actual time.

"Soil moisture tests can be completed in a short time by the alcohol method, but the discordant results with soils of different characteristics make it unsatisfactory for general use."

The production of alcohol from cane bagasse, M. B. Sturgis and W. P. Denson (*Louisiana Stas. [Bien.] Rpt. 1928–29, p. 32*).—Used as an aid to molasses fermentation, bagasse was found to make possible the efficient treatment of molasses mixtures much more concentrated than otherwise could be handled, while the bagasse remained as valuable for the manufacture of fiber board after the fermentation as before. The spent bagasse recovered from the fermentation process was still subject to deterioration in storage but could be made immune to such damage by an acetic fermentation following the alcoholic.

METEOROLOGY

Weather forecasting from synoptic charts, A. J. Henry (*U. S. Dept. Agr., Misc. Pub. 71 (1930), pp. 80, figs. 31*).—The author states that "this publication, of which the sections on synoptic charts and early forecasting in the United States and abroad are mainly historical, aims to present an account of the methods and practices of weather forecasters so that the average citizen who is interested in such matters may have at his disposal a connected account not only of the material used but also of the manner of its use." Although the subject is dealt with in a comprehensive way, it is pointed out that the publication "is distinctly not a handbook of weather forecasting."

A bibliography of 16 references is appended.

Climatological data for the United States by sections, [January–February, 1930] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 17 (1930), Nos. 1, pp. [200], pls. 3, figs. 4; 2, pp. [201], pls. 2, figs. 7*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State for January and February, 1930.

Monthly Weather Review, [January–February, 1930] (*U. S. Mo. Weather Rev., 58 (1930), Nos. 1, pp. 42, pls. 15, figs. 21; 2, pp. 43–84, pls. 12, figs. 26*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for January and February, 1930, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 1.—Cyclones and Anticyclones of the Northern Hemisphere, January to April, Inclusive, 1925 (illus.), by C. L. Mitchell (pp. 1–22); and Meteorological Notes on the Formation of Ice on Aircraft, by C. G. Andrus (pp. 22–24).

No. 2.—Measurements of Solar Radiation Intensity and Determinations of Its Depletion by the Atmosphere (illus.), by H. H. Kimball (pp. 43–52); Summer and Autumn Pressure Anomalies Affecting Winter Temperatures in the Upper Mississippi Valley (illus.), by T. A. Blair (pp. 53–58); The Measurements of the Albedo of a Snow Cover (illus.), by M. N. Kalitin (pp. 59–61);

At What Temperature Does Frost Occur? by W. J. Humphreys (p. 61); Frequencies of Tropical Cyclones, Especially Those of Minor Importance, by S. S. Visher (pp. 62–64); and Tradition Versus History in American Meteorology, by E. R. Miller (pp. 65, 66).

SOILS—FERTILIZERS

Equipment and procedure for obtaining the displaced soil solution, J. P. Conrad, E. L. Proebsting, and L. R. McKinnon (*Soil Sci., 29 (1930), No. 5, pp. 323–329, pl. 1, fig. 1*).—The apparatus described in this contribution from the California Experiment Station consisted of a flanged iron tube having an inside diameter of 6 in. and a length of 17.5 in., provided at the top with a tight gasketed lid carrying an inlet and an escape valve for compressed air and at the bottom with a perforated filter plate capable like the lid of being attached tightly to the flanges with 8 short cap screws.

"In making a displacement, slightly more than 8 kg. of soil is taken from a single plat by the use of a soil tube, and is brought to the laboratory in a covered pail. With the displacement tube dry, greased on the sides, and the bottom covered with a 6-in. filter paper, the sample is placed in the tube in 7 to 10 increments, each one being rammed down with the tamper shown. . . . No attempt is made to bring the soil moisture up to optimum, the soil being displaced at the moisture percentage occurring in the field at the time of sampling. Two liters of distilled water is added above the soil, the funnel is adjusted, and a flask to catch the drippings is provided.

"The labor of displacing with one large tube is reduced to slightly more than one-fourth that for the four small tubes holding the same amount of soil. . . . The procedure followed in making a displacement with this equipment is similar to that with the small tubes. . . . The use of pressures up to 200 lbs. to the square inch was found to be undesirable because puddling of the soil occurred, resulting in a decreased yield. Successive aliquots of about 50 cc. each are tested by electrical conductivity for the 'break,' i. e., when dilution causes the conductance to decrease." The composite solution of the portions taken before the "break" is used for the analysis.

A working drawing and a photograph showing a set-up of four of the tubes are reproduced with the paper.

Relation of the amount and nature of exchangeable cations to the structure of a colloidal clay, L. D. Baver (*Soil Sci., 29 (1930), No. 4, pp. 291–309, figs. 5*).—The work noted in this communication from the Missouri Experiment Station included studies of the reaction and specific conductivity of the experimental material, its flocculation, migration velocity, particle size, rate of ultrafiltration, its viscosity, and some other characteristics.

The saturation capacity of the (Putnam) clay used was found by titrating the H-ion saturated material with various bases to be 57 milliequivalents for 100 gm. of the clay. "The reaction of the clay sols containing various amounts of the different cations was greatest according to the lyotropic series of cations: Li>Na>K>Mg>Ca>H. The specific conductivity followed the order: Na>Li>K>Mg>Ca. The flocculation values of the Li-, Na-, K-, Mg-, and Ca-sols were 536, 536, 217, 67, and 67 milliequivalents of base per 100 gm. of clay, respectively, with a 2.3534 per cent by weight suspension. The monovalent cations increased the charge on the particles to a maximum at the saturation capacity of the colloid. The charge decreased as the concentration of ions increased beyond this point. Divalent cations decreased the charge. The average radius of the H-aggregates was 136$\mu\mu$, that of the Ca-aggregates was 148. The size of the pores in the Ca-clay were much larger than those in the Na-clay. Small amounts of monovalent cations produced a decrease in viscosity. This was followed by an increase to a maximum near the saturation point of the clay. Here a rapid decrease occurred, followed by an increase when flocculation took place. The divalent cations decreased the viscosity to the point of flocculation where it increased sharply. The hydration and viscosity of the clay aggregates were greatest according to the order: Li>Na>K>H>Ca>Mg."

The physicochemical properties of these clay sols are considered dependent upon the number of active ions on the particle, and the size, stability, and low degree of hydration of the calcium and the magnesium aggregates were found important in the production and maintenance of good soil structure.

The effect of the amount and nature of exchangeable cations on the structure of a colloidal clay, L. D. Baver (*Missouri Sta. Research Bul. 129* (*1929*), *pp. 48, figs. 9*).—A somewhat more condensed report of above investigation.

An index of friability of soils, O. Christensen (*Soil Sci., 29* (*1930*), *No. 2, pp. 119–135, figs. 17*).—"A study of the mechanical properties of a series of soils indicates that the stress-strain relationships for compression tests are consistent and reproducible. Data are presented showing the variation of the mechanical characteristics of soils with variation in the composition of the soil and also with varying moisture percentages. The property of friability is given a precise definition, and preliminary values are presented. An empirical equation is developed expressing the index of friability F in terms of the moisture percentage w, with two parametric constants characterizing the soil, as follows:

$$F=F_0e^{kw}$$

"Numerous curves and tables are presented illustrating the development of the theory and the experimental results obtained."

The instrument devised and used for the measurements required is diagrammatically illustrated. The paper is a contribution from the Utah Experiment Station.

How the North Carolina soil survey is being used to help farmers, C. B. Williams (*North Carolina Sta. Agron. Inform. Circ. 51* (*1930*), *pp.* [*1*]+*4*).—The circular is intended to provide popular information on the advantages and practical application of soil survey data.

Soil chemistry and bacteriology (*New Jersey Stas. Rpt. 1929, pp. 48–51*).—Reports are here given of three phases of the work.

Soil microbiology.—Among numerous observations and conclusions drawn from the year's work, "it has been shown that, in the formation of organic matter in lowmoor peats, the celluloses and hemicelluloses have a tendency to decompose rapidly while the lignins and proteins accumulate, the celluloses and hemicelluloses as a result of the fact that they are very resistant to decomposition by microorganisms under anaerobic conditions, and the lignins and proteins because they are synthesized by the microorganisms in the process of decomposition of the celluloses and hemicelluloses. However, highmoor peats are rich in celluloses and hemicelluloses because of the greater resistance of these materials in the sphagnum plants to decomposition by microorganisms. As a result . . . the highmoor peat contains less nitrogen than the sphagnum plants from which it originated, while the lowmoor peat contains considerably more nitrogen than the plants that gave origin to it, because of the synthesizing activities of the microorganisms that use the celluloses as sources of energy."

"It has been found that the mechanism of decomposition of plant material depends primarily upon three factors; namely, (1) the chemical composition of the plant residues, (2) the nature of the microorganisms active in the decomposition processes, and (3) the environmental conditions under which the decomposition is carried out." Several organisms, aerobic and anaerobic, capable of decomposing actively such celluloses, especially, as mannans, galactans, and pentosans were isolated; and it was found that "there is much less specificity among the microorganisms decomposing the hemicelluloses than among those capable of decomposing celluloses."

The growth of higher plants stimulated that of microorganisms in the neighborhood of the plant roots, the Radiobacter group being most affected, the Actinomyces least. Plate counts of the filamentous forms indicated "no significant consistent influence of plant growth upon their prevalence. . . . The carbon dioxide evolved from soils obtained from the Rhizosphere was greater than that from fallow soils."

Soil colloids.—Soil colloid properties were found dependent upon equilibria involving the exchangeable ions. Solution, dispersion, charge, swelling, and viscosity were found "directly dependent on the degree of dissociation of the colloidal complex." A fuller account of this work has been noted from another source (E. S. R., 63, p. 211).

Base exchange.—"The movement of iron and aluminum in the soil has been investigated. There are indications that the iron ions replace the aluminum ions, and that the aluminum ions are being lost in the drainage waters."

A method of studying the activity and rate of diffusion of protozoa and bacteria in the soil, L. Losina-Losinsky and P. F. Martinov (*Soil Sci., 29 (1930), No. 5, pp. 349–362, figs. 5*).—By demonstrating the diffusion of the organisms under consideration from central inoculations in petri dishes of sterilized soil, the authors of this contribution from the Scientific Meliorative Institute, Leningrad, Russia, showed that "amebas (Vahlkampfia) and ciliates (*Colpoda steini*) exist in the soil in an active state. After the center of petri dishes containing sterile soil have been inoculated with cultures of protozoa mixed with *Bact. radicicola* these organisms diffuse from the place of inoculation to the periphery of the petri dish. The detection of protozoa some time afterward at a considerable distance from the place of inoculation shows that they are living in the soil and can move freely in it." The rate under favorable conditions was such that "the introduction of one loop of the culture into sterile soil is sufficient to inoculate, within a few days, the whole volume of soil in the dish with protozoa; the smallest quantity of the soil taken from any part of the dish would then give a rich culture of protozoa on the agar plate within two or three days."

Of conditions affecting these movements of the microbial soil population, soil moisture and mechanical structure of the soil were found most important. "At a moisture content of from 15 to 20 per cent (25 to 40 per cent of the water-holding capacity) bacteria and amebas are in an active state, but diffuse slowly in the soil, whereas *C. steini*, in most cases, does not diffuse in the soil farther than 1 cm. from the place of inoculation. At a soil moisture content of more than 20 per cent all protozoa are extremely active and diffuse rapidly through the whole soil.

"When the moisture content of the soil is comparatively small, amebas diffuse more rapidly than ciliates, but at a greater moisture content (more than 60 per cent of the water-holding capacity) the infusoria move more rapidy than the amebas. Bacteria, in their progressive movement, always precede the protozoa, the bacteria (*B. radicicola*) serving as a source of food for the protozoa."

The effect of turning under cane trash upon the available nitrogen of the soil, M. B. Sturgis and W. P. Denson (*Louisiana Stas.* [*Bien.*] *Rpt. 1928–29, pp. 32, 33*).—Fresh trash caused a rapid and marked drop in the nitrate content of the soil. This change was usually accompanied by a slight gain in total soil nitrogen, however. After the trash had been in contact with the soil for several months it affected the soil nitrate concentration much more slowly than when fresh; and the addition of trash, in contact with soil for some months and partly decomposed, to potted soils planted to corn increased both the growth rate and the total dry matter yield. The cane trash increased the moisture-holding capacity and decreased the drying rate of soils to which it had been added, an observation considered to indicate its value in drought seasons.

Department of soil chemistry and bacteriology, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1929, pp. 314–326*).—The 1928 data are added to the record of the continuous fertilizer experiments listed below (E. S. R., 61, p. 714).

Availability of nitrogen in nitrate of soda, sulfate of ammonia, and dried blood, with varying ratios of phosphoric acid and potash—season 1928 (pp. 314–318).—"With slight exception, the nitrate of soda gave higher yields than any of the other nitrogenous materials and in all cases the yields with this were higher than those with the sulfate of ammonia. . . . In the majority of cases nitrate of soda shows the highest recovery."

Continuous wheat and rye with and without a legume green manure crop—season 1928 (pp. 318–320).—"In the case of both wheat and rye, the yield was materially increased by the green manure crop—about 6 bu. an acre of wheat and 7.1 bu. of rye. . . . Neither the green manure nor the top dressing had a pronounced influence on the percentage of nitrogen in the dry matter. The total nitrogen returned through the crop reflected the influence of both the green manure and the top dressing."

Continuous growing of corn with a legume and a nonlegume green manure crop—1928 (pp. 320, 321).—"The yields of dry shelled corn on this section are on an average nearly twice as large as the yields on the nonlegume section. This increase in yield, however, must be attributed in part to the residual effect of previous cover crops. . . . The percentage of nitrogen in the dry matter has not been appreciably influenced by either the farm manure or the green manure."

Influence of lime on yield and nitrogen content of alfalfa and corn, 1927 and 1928—plats E, F, G, H (pp. 322–325).—The corn yield from the limed plat was more than 1.5 times that from the unlimed. "For the corn the lime treatment did not influence the percentage of nitrogen in the crop as it did in the alfalfa, though the grain and stalks from the unlimed plat show the lowest percentages of nitrogen. The total nitrogen returned through the crops from plats F and G [limed] is about one and a half times as much as the total returned from the unlimed plat, whereas plat H [limed] returned one and two-thirds times as much as the unlimed plat."

Use of concentrated fertilizers for crops grown on soils varying in mechanical composition (pp. 325, 326).—"A fertilizer containing 50 units of plant food may be used at the rate of 500 lbs. an acre on a soil that is almost wholly sand, without crop injury. This work confirms that previously reported [E. S. R., 61, p. 715] and seems to show that a concentrated fertilizer may be used in even larger amounts than are required, without crop injury."

Effect of cropping with various fertilizer, manure, and lime treatments upon the exchangeable bases of plot soils, C. J. SCHOLLENBERGER and F. R. DREIBELBIS (*Soil Sci., 29 (1930), No. 5, pp. 371–394*).—The procedure adopted in the experiments here reported from the Ohio Experiment Station is thus stated:

"Auger samples from the half plats to the depth of 6⅝ in. and taken in sufficient number to ensure a sample representative of the half plat were air-dried and passed through a 2-mm. sieve. One-hundred-gram portions were leached with 750 cc. normal ammonium acetate at pH 7.07 and afterwards with neutral 80 per cent alcohol. In the ammonium acetate leachings exchanged hydrogen, aluminum, manganese, calcium, magnesium, potassium, and sodium were determined, and in the residue of soil absorbed ammonia and residual carbonates. Samples of the original soil were examined for exchangeable ammonia, for carbonate, and for pH."

As differences between the samplings of 1894 and those of 1925, it is noted that the unlimed soil was higher at the time of the last named analyses in exchangeable hydrogen and aluminum, lower in exchangeable manganese, calcium, magnesium, potassium, and sodium, and lower also in total base absorbing capacity. The limed soil was found much lower in exchangeable hydrogen, aluminum, and manganese, and slightly lower in exchangeable potassium and sodium.

Of the effects of fertilizers without lime it is considered that "exchangeable hydrogen has possibly been increased by superphosphate, but it is certainly higher as the effect of sulfate of ammonia, and is probably higher as the result of using dried blood and oil meal as ammoniates. Muriate of potash is not indicated to have any effect upon exchangeable hydrogen, but nitrate of soda, nitrate of lime, and basic fertilizers such as bone meal decrease it. The tendency of manure appears to be to decrease exchangeable hydrogen, although the indications of two plats are inconsistent; pH values vary with exchangeable hydrogen in a reasonably regular manner. Aluminum tends to follow exchangeable hydrogen, although the quantity is so small that it is comparatively insignificant. Manganese is little affected by fertilizers, although apparently increased by manure and by sulfate of ammonia. Calcium in the exchangeable form is increased by fertilizers containing calcium, such as superphosphate and nitrate of lime, as well as by those fertilizers carrying alkaline calcium compounds, such as basic slag or cyanamid. Muriate of potash is without noticeable effect upon exchangeable calcium, but nitrate of soda has effected some conservation of calcium, or increased the tendency for this element to be accumulated. Manure causes a net gain in exchangeable calcium. Oil meal in complete fertilizer was favorable to conservation of calcium, dried blood less so, and sulfate of ammonia responsible for a large loss. Magnesium has been increased by manure but heavily depleted by sulfate of ammonia. Potassium is little influenced by fertilizers not containing it. The accumulation of potassium in the exchangeable form has been most marked on plats receiving potash alone or in an incomplete mixture, but there has been considerable accumulation on all plats receiving potash. Sixteen tons of manure to each rotation has raised exchangeable potassium to a high level, but eight tons has not done so. During the six years since complete fertilization of one plat was discontinued, exchangeable potassium in the soil has fallen almost to the same level as that of soil never fertilized. Of the potassium applied in fertilizer and probably not removed in the crops, only about a quarter appears as exchangeable potassium in the surface soil. There has been comparatively slight tendency toward the accumulation of sodium in exchangeable form as a residue from nitrate of soda. Figures for exchangeable ammonium are low and show little consistent variation, except that the unlimed plat receiving sulfate of ammonia is highest. Extracted bases exceed ammonium exchanged on unlimed samples."

A similar series of observations on the limed soils is recorded.

The quantities of phosphoric acid and of potassium drawn by various plants from air-dried and from heated soils of various acidity, as determined by the seedling method of Neubauer [trans. title], K. SCHUMANN (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 15 (1929), No. 2-3, A, pp. 65-94), figs. 7*).—Heating the soils in a drying oven at from 80 to 100° C. had no significant effect upon the reaction. All the plant varieties used took up more phosphoric acid and potassium from the heated than from the unheated soils; and this effect of the heating of the soils is considered an indication of the care which should be taken to secure uniform pretreatment of soil samples to be used for the Neubauer test (E. S. R., 50, p. 118).

The ability of the various species to take up nutrients from the soil samples was variously affected by the degree of acidity of the soil. In general the species showing the greater resistance to injury by alkalinity were the more readily injured by soil acidity, and vice versa. Injury from soil acidity made itself apparent only gradually; and on the alkaline soils nutrient absorption ran parallel among the various species up to pH 8.3, as determined in boiled potassium chloride extract. Above the indicated degree of alkalinity, however, the individual degrees of sensitiveness of the various species became noticeable. With respect to this observation of the influences of acidity and of alkalinity, field experiments agreed with the pot results.

Rye is considered, for the following reasons, to be the plant best suited for use in the Neubauer procedure: It has a large capacity for the absorption of phosphoric acid and potassium and a correspondingly low "blank" (blinden Wert) to be determined; it behaves similarly in soils of various degrees of acidity; its growth period in the Neubauer dish is short; and its root branches freely.

Exchangeable calcium and potassium in soils as affected by cropping and fertilization, B. D. WILSON (*Soil Sci., 29 (1930), No. 2, pp. 91-100*).—The material used in the work described in this contribution from Cornell University consisted of samples of six soils, representing three series and cropped in cylinders to a 4-year rotation for a period of 15 years. Treatments consisted in the application of limestone, of mineral fertilizers, and of both of these treatments, other cylinders receiving neither treatment. Exchangeable calcium and potassium were determined in these soils by electrodialytic extractions conducted in a manner essentially similar to that indicated in earlier contributions (E. S. R., 63, p. 212).

Limestone treatment increased the exchangeable calcium content of some but not all of the soils studied, a possible explanation offered being the pre-existence at the time of liming of an equilibrium between exchange complex and excess of calcium carbonate already present, in the soils which did not respond by an increase in exchangeable calcium when limed. A relation between the quantity of limestone applied and the subsequently determined exchangeable calcium content did not appear.

The addition of fertilizers, whether with or without limestone, had little or no effect upon the exchangeable calcium content of the soils; and treatment with potassium chloride in no case increased the exchangeable potassium content. "At the end of the experiment the soils contained few exchangeable cations other than calcium." During the course of the experiment the exchangeable potassium, and, with one exception, the exchangeable calcium, of the untreated soils were reduced, the exception being that of one of the untreated soils the calcium content of which remained unchanged.

The calcium content of the soils was found not to be related either to the initial or to the final exchangeable calcium content.

"The results of the experiment suggest that the quantity of exchangeable calcium held in the colloidal complex of humid soils resulting from an application of calcium carbonate depends more on the ability of the soils to adsorb calcium than upon the quantity of calcium applied to them in the form of lime. In that event the hydrogen-ion concentration of a soil that contains native calcium carbonate or one to which lime has been applied would not necessarily be a relative measure of its content of exchangeable calcium."

The fixation of the potash of a green manure by liming materials, W. H. MacIntire and K. B. Sanders (*Soil Sci., 29 (1930), No. 2, pp. 109–117, figs. 3*).—The work of the Tennessee Experiment Station here reported was carried out in 18 pairs of outdoor lysimeters and consisted essentially in the study of the effects of a hydrated lime of high calcium content, of 40- to 50-mesh and of 100-mesh limestone, and of dolomite upon the conservation of potassium introduced in quantities of red clover equivalent to 2 and to 8 moisture-free tons to the acre, the calcium oxide equivalents of the liming treatments having been 2,000 lbs. for 2,000,000 lbs. of soil.

A previous conclusion that "an economic addition of either of the more commonly used liming materials" will lessen the potassium content of the free soil water in an unfertilized soil (E. S. R., 58, p. 621) was confirmed. The addition of liming materials with the turned under red clover uniformly decreased the quantity of potassium lost by leaching, the quantitative effect of the three liming materials used appearing to be the same. The calcium oxide-magnesium oxide content of an 8-ton addition of red clover appeared sufficient to increase the capacity of the soil to retain additions of soluble potassium compounds.

It is considered possible that "the availability of the added potash that was rendered less soluble by liming materials may be specific for plants of different root development."

Translocation of calcium in soils as measured by electrodialysis and plant growth, B. D. Wilson (*Soil Sci., 29 (1930), No. 5, pp. 331–337*).—A contribution from the New York Cornell Experiment Station, the paper noted presents the results of experiments on three soils (a Dutchess silt loam, a Volusia silt loam, and a Lordstown stony silt loam) of glacial till origin and all somewhat acid. Both pots and cylinders were used, and "in each case the surface layer of soil was treated with limestone or precipitated calcium carbonate. . . .

"The soils of the cylinders were exposed to natural weathering for 15 years, during which time they were cropped to a rotation of fodder corn, timothy, barley, and clover. The soil of the pots was leached with distilled water for 15 months, after which the upper layer of soil was removed and the lower layer planted to sweetclover. The experiment with the potted soil was conducted in the greenhouse.

"At the end of the experiments the quantity of calcium that was fixed in layers of soil below lime-treated layers was ascertained by analyzing the soil for exchangeable calcium by means of electrodialysis. The growth of sweetclover was also used as a measure of the translocation of calcium from lime-treated to untreated layers of soil. Under the conditions of the experiments, calcium was found to be fixed in each of the three soils below layers of soil that had been treated with lime. With one exception, no mechanical movement of the limestone or of the precipitated calcium carbonate was indicated from analysis of the soils for carbonate.

"It is evident from the results presented that the soils of the investigation adsorbed exceedingly small quantities of calcium from the drainage water as it passed through them. Nevertheless the quantity so fixed was of sufficient magnitude, during a comparatively short period, to influence materially the growth of sweetclover."

Neutralizing values and rates of reaction with acid soils of different grades and kinds of liming materials, W. H. Pierre (*Soil Sci., 29 (1930), No. 2, pp. 137-158, fig. 1*).—The results and conclusions derived from the experiments of the Alabama Experiment Station here reported include the following:

A limestone ground coarser than 20 mesh showed a very slow reaction, giving a value of about 20, as against 100 for precipitated calcium carbonate, after 2 years in a soil of medium acidity. In an extremely acid soil the corresponding value was 37 after 1 year. The 2-year figure for limestone of from 20- to 60-mesh grade was about 60 in a soil of medium acidity, the 1-year figure about 88 in 2 very acid soils.

The finer grades of crushed oyster shells showed neutralizing values about the same as those found for similar grades of limestone, but the coarser shells appeared "slightly less effective than the coarse grade limestone."

"The neutralizing value of the ordinary basic slag as measured against boiling 0.4 N HCl was found to be completely effective in neutralizing the acidity of a very acid soil. With the medium acid soils, however, it was found that after 2 years only about 80 per cent of its potential neutralizing value is effective. The low grade basic slag, which contains considerable coarse material, was found to be much less reactive than the finer, ordinary basic slag. On the basis of equal potential neutralizing value it was found to be about 80 per cent as effective as the latter. The use of ground limestone and crushed oyster shell coarser than 20 mesh was effective in neutralizing some of the acidity developed by the use of ammonium sulfate fertilizer, and in maintaining the yields of Austrian winter peas."

A note on some experiments dealing with sulphur treatment of a soil and its effect on wheat yield, M. D. Glynne (*Roy. Soc. Victoria, Proc., n. ser., 42 (1929), No. 1, pp. 30-35*).—The experiments noted were made on land of the Melbourne University agricultural department and on a plat upon which wheat had been grown continuously for 14 years, with poor yields in the latter part of the period.

The treatment consisted in the application of sulfur as the element, as ammonium sulfate, and as sulfuric acid, followed in a few days by calcium carbonate sufficient for neutralization, the sulfur in each form being applied in the proportions 0.05, 0.10, and 0.15 per cent of the element. Mixture was effected by removing 300 lbs. of soil from subplats 1 yd. square, incorporating the respective chemicals in these portions of soil, and replacing the soil on the subplat. The test crop was Federation wheat. On account of the necessity for neutralizing the sulfuric acid treatments, check squares were treated with calcium carbonate only.

The calcium carbonate alone gave a slight, relatively insignificant increase. The sulfur treatment, however, and the sulfuric acid, whether neutralized with calcium carbonate or not, were followed by large increases in yield; and the same proportion of sulfur gave even larger increases when applied as ammonium sulfate. Disease was found only to a small extent, and its incidence was sufficiently uniform to lead to the conclusion that "the results appear to depend on nonpathological factors." Alteration in soil reaction is considered also ruled out by the fact that the neutralized sulfuric acid treatment had the same effectiveness as had the treatment with the acid alone. It is concluded that "a sulfur deficiency of the soil would explain the results obtained. . . . The larger increase in crop obtained with ammonium sulfate than with an equal quantity of sulfur as the element or the acid suggests a nitrogen deficiency. The possibility is indicated that sulfur may have an effect on the nitrogen-fixing bacteria, which may be related to the dark green appearance of the treated plats."

Registration, labeling, inspection, and sale of commercial fertilizers, 1929, L. D. HAIGH (*Missouri Sta. Bul. 284* (*1930*), *pp. 58*).—The report contains the usual analyses, guaranties, and other information and advice to purchasers.

AGRICULTURAL BOTANY

Plant physiology (*New Jersey Stas. Rpt. 1929, pp. 44, 45*).—Continuing work in plant nutrition (E. S. R., 61, p. 718), it was found that the soluble or functioning iron fractions in plant tissues fluctuated more in plants in which the pH of the tissue fluids was close to the precipitation point of iron than in plants in which the pH was considerably below this point.

Studies of the relative rates of the absorption of nitrogen in the form of NH_4^+ and NO_3^- brought out the fact that when nitrogen is present in the culture medium in the salts of the forms mentioned, the total nitrogen absorbed by the plants for a unit weight of dry plant material is determined during the early stages of growth by the absorption of NH_4^+ and during the later stages of growth by the absorption of NO_3^-. With both buckwheat and oats, ammonium absorption was greater than that of nitrate in the first half of the life cycle, with the situation reversed in the second half. The maximum rate of the total nitrogen absorption occurred during the reproductive phase.

Nitrogen taken up as NH_4^+ was evidently more closely associated with the synthesis of organic nitrogenous compounds than was NO_3^- nitrogen. The synthesis of organic nitrogenous compounds by a unit weight of plant tissue was most rapid in the early stages of growth. Nitrogen in the form of ammonium was the only nitrogen fraction investigated which increased in the plant tissues, for a unit weight of tissue, with an increase in the age of the plants. In plants of a given age, the insoluble organic nitrogen fraction was most constant and was least influenced by the nature of the culture solution. The insoluble organic nitrogen fraction was, on the other hand, the most influenced by age.

At a temperature above 25° C. further changes had little effect on the hourly absorption rates of nitrogen in the form of NH_4^+ and NO_3^- when both were present in the culture solution. Below 25° an increase or decrease in temperature produced a corresponding change in the hourly rates of absorption, with greater effect on the NH_4^+ than on the NO_3^-.

The effects of X-radiation on cotton, J. W. MCKAY and T. H. GOODSPEED (*Science, 71* (*1930*), *No. 1851, p. 644*).—A preliminary account is given of experiments on the effects of X-radiation on the behavior of cotton plants. Seedlings were grown in a greenhouse from a single plant of a strain of Half-and-Half cotton, and just before anthesis the flowers were emasculated and the anthers exposed in gelatin capsules to X-rays for varying periods of time, after which the pollen was used to fertilize the emasculated flowers. Seventeen mature bolls, containing 311 seeds, were obtained. In 1929 half of these seeds were planted in a greenhouse at Berkeley, Calif., and 21 plants were grown to maturity. The remaining treated seeds were planted in the open, but they failed to mature. Plants from untreated pollen were grown as a control.

Among the treated plants there was noted a decrease in the number of seeds produced with an increase in the dosage of the charge, and further evidence of sterility was shown by the production of only 21 plants from more than 150 seeds sown. Numerous morphological changes were also observed in the treated plants, some of which were distorted and had deformed stigmas, leaf peculiarities, dwarfness, etc. Changes were also noted in the seeds. Whereas the parent variety is quite uniform in seed size, the seed from the treated plants varied widely. There were also striking differences in lint characters, some of the seed of the treated plants being entirely naked at maturity. The original variety is characterized by having the lint closely adherent. The experiments are believed to suggest that quantitative and qualitative alterations in the hereditary material may readily be induced in cotton by treatment with X-rays.

The microflora of the rhizosphere of wheat [trans. title], G. Truffaut and V. Vladykov (*Compt. Rend. Acad. Sci.* [*Paris*], *190* (*1930*), *No. 13*, *pp. 824–826*).—For diverse varieties of wheat found in six separate regions of France there was found an identical rhizospheric microflora. The organisms found belonged to the groups most important to the nutrition of the wheat, namely, ammonifying, nitrifying, and nitrogen-fixing organisms and those characterized by the decomposition of cellulose, the reduction of sulfates, and the oxidation of iron compounds.

Enzymes in Alternaria solani [trans. title], G. v. Szelényi and G. v. Becze (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *76* (*1928*), *No. 1–7*, *pp. 121–124*).—A study is outlined of nutrient uptake and enzyme activity during the development of *A. solani*. Saccharose, maltose, lactose, and starch were vigorously taken up, raffinose less strongly appropriated. As endoenzyme, only invertase was clearly demonstrable. As exoenzymes, sucrase, maltase, and lactase were demonstrated.

Plant material introduced by the Office of Foreign Plant Introduction, Bureau of Plant Industry, [July 1, 1927, to December 31, 1928] (*U. S. Dept. Agr.*, *Inventories Nos. 92* (*1929*), *pp. 28*; *93*, *pp. 34*; *94*, *pp. 34*; *95* (*1930*), *pp. 40*; *96*, *pp. 20*; *97*, *pp. 48*).—These six issues present by quarterly periods brief descriptive notes and comments on 4,296 lots of plant material introduced from various parts of the world.

GENETICS

Nuclear divisions in the pollen mother cells of Triticum, Aegilops, and Secale and their hybrids, A. E. Longley and W. J. Sando (*Jour. Agr. Research* [*U S.*], *40* (*1930*), *No. 8*, *pp. 683–719*, *pls. 4*, *figs. 9*).—Cytological studies of the genera Triticum, Secale, and Aegilops and some of their hybrids are reported on. The haploid chromosome number in species of these genera is seven or a multiple thereof. The chromosome behavior during meiosis of the developing pollen mother cell in species of these genera was regular, producing normal tetrads with each cell receiving the same number of chromosomes. Very few chromosome abnormalities were observed in hybrids of *S. cereale* × *S. montanum*.

Pollen mother cells of triploid and tetraploid wheat hybrids showed a number of abnormalities in chromosome behavior. Univalent and a few bivalent chromosomes are present in variable numbers in the early heterotypic phases.

Many of the univalents split longitudinally in the heterotypic division. Only two nuclei and two cells are produced by the heterotypic division. The homotypic division is characterized by random distribution and frequent extrusion of the halves of univalent chromosomes that split in the previous division. Extruded chromosomes frequently form micronuclei. Tetrads are four-celled, but many of the cells are polynucleated.

In Triticum × Secale and Aegilops × Triticum hybrids the chromosome behavior showed the following abnormalities: Univalent and a few bivalent chromosomes are present in varying numbers in the early heterotypic phases. Occasionally univalents split longitudinally in the heterotypic division. Frequently univalents collect in the center of the cell without any indication of a mitotic division. However, this centrally located chromatin mass is often divided in an amitotic manner by the forming cell wall. The number and size of the cells produced by the heterotypic division is variable. The second reduction division is more regular than the first; whenever univalents are present in the chromosome complement they are distributed at random to the poles or are extruded into the cytoplasm. Tetrads often have more than four cells, due to the irregular heterotypic division; some of the cells of the tetrad may be polynucleated.

The hybrid *A. crassa* × *T. dicoccoides* had a chromosome behavior more like that described for Triticum × Triticum hybrids than that of Aegilops × Triticum hybrids, which suggested that *T. dicoccoides* is more closely related than other Triticum species to the genus Aegilops. F_3 plants of *A. ovata* × *T. dicoccum* indicated a tendency toward doubling of chromosome numbers. The few plants examined had from 25 to 27 haploid chromosomes.

The variable chromosome pairing found in hybrids of *T. monococcum* and members of the emmer and *vulgare* groups suggested a distant relationship between this species and the polyploid Triticum groups. A more distant relationship than this appears to exist between species of Aegilops and Triticum, as was indicated by the chromosome behavior in hybrids between these genera. The chromosome behavior in Triticum × Secale hybrids suggested an even more distant relationship between these genera than between Triticum and Aegilops.

✓ **Studies in the inheritance of physiological characters—I, A physiological investigation of the nature of hybrid vigour in maize,** E. Ashby (*Ann. Bot. [London], 44 (1930), No. 174, pp. 457–467, pl. 1, fig. 1*).—Comparative cultures of two strains of corn and their F_1 hybrid at the Imperial College of Science and Technology, London, showed that as soon as the plants were above ground the characteristic vigor of the hybrid was visible, and the hybrid plants were larger than either parent throughout the experiment. It was found that the hybrid does not differ in the least from its more vigorous parent as regards relative growth rate, nor from either parent as regards cell size, photosynthetic efficiency of leaves, or the time of flattening of the sigmoid curve of growth. The only physiological differences observed were an increased percentage germination by the hybrid and also a greater initial weight of the embryo, which gave an advantage maintained throughout the grand period of growth. The phenomenon of hybrid vigor seemed due to some process between fertilization and the setting of seed. The relative growth rate appeared to be inherited in the manner of a dominant Mendelian factor.

✓ **Unusual crossing in oats at Aberdeen, Idaho,** F. A. Coffman and G. A. Wiebe (*Jour. Amer. Soc. Agron., 22 (1930), No. 3, pp. 245–250, fig. 1*).—Natural crossing occurred in 46 of 69 plants of Richland oats grown at Aberdeen, Idaho, in 1927. In 46 progeny rows from these plants containing dark-kerneled aber-

Hereditary abnormalities of the limbs, their origin and transmission.—II, A morphological study with special reference to the etiology of clubfeet, syndactylism, hypodactylism, and congenital amputation in the descendants of X-rayed mice, H. J. Bagg (*Amer. Jour. Anat., 43 (1929), No. 2, pp. 167–219, pls. 5, figs. 3*).—This is a continuation of studies of the inheritance of certain defects which developed in the offspring as a result of X-ray treatment of the parents (E. S. R., 55, p. 27). The various types of clubfeet, syndactylism, hypodactylism, congenital amputation, and polydactylism observed in the examination of 5,280 individuals at birth and at different stages in the gestation period while in utero are described.

There were 432 animals observed with foot defects. Of these, 300 animals had clubfeet, 159 of which were males and 131 females, with the sex unknown in 10. The 384 clubfeet observed in these animals were distributed as follows: 123 left front feet, 156 left hind feet, 25 right front feet, and 80 right hind feet, making a total of 279 on the left side and 105 on the right side of the body. There was considerable variation in the characteristics of the clubfooted individuals. The types were classified into three groups, i. e., clubfeet with dorsal flexion and syndactylism, clubfeet with palmar flexion and syndactylism, and clubfeet with marked distortion of the entire foot.

There were lesser numbers of individuals showing other foot defects. Syndactylism without clubbing was found in 9, hypodactylism in 27, congenital amputation in 16, and polydactylism in 93 individuals.

The development of foot defects in utero was followed through prenatal life by operating on a number of pregnant females as many as four successive times. These observations indicated that the abnormal foot development was associated with an arrest in the development of the part at about the twelfth to thirteenth day of gestation. The arrested development was due to a perivascular lymph stasis on the dorsal surface of the foot. A blister formed in the subcutaneous tissues and later blood escaped into the bleb, forming a solid clot. The clots were absorbed soon after birth. Their size, severity, and position determined the type of foot abnormality which developed. Arrest in development at a critical stage in the same way appeared to explain polydactylism in much the same manner as pinching off the apical bud of a twig causes dichotomous growth. Small localized lesions which might have such an effect were observed. Attention is called to the association of other abnormalities with the foot defects and the observance of hemorrhagic areas in other regions. In breeding studies it was found possible to increase greatly the number of animals with foot defects, and it was found that the foot abnormalities were inherited as a recessive Mendelian factor.

A morphological analysis of the foot abnormalities occurring in the descendants of X-rayed mice, A. M. Bean (*Amer. Jour. Anat., 43 (1929), No. 2, pp. 221–246, figs. 14*).—A morphological study of the abnormal feet observed in the descendants of X-rayed mice has disclosed a series of 17 types, which are described. A reduction in the number of tarsal or carpal bones by fusion was observed in practically all abnormal feet. The operation of a single underlying cause is suggested, which appears to be the influence of arrested development noted in the above article by Bagg.

The effect of yolk injections on the plumage of an ovariotomised Brown Leghorn hen, S. Kopeć and A. W. Greenwood (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 121 (1930), No. 1–2, pp. 87–95, figs. 23; Ger. abs., p. 95*).—A Brown Leghorn hen was ovariotomized at 10 days of age. The first plumage was typically of the female type, but later showed a mosaic of male and female feathering. When the bird was given five abdominal and subcutaneous injections of egg yolk over a 20-day period, the feathers developing after that time were of the female type. After yolk injections ceased, the feathering returned to the male type.

Effect of thyroxin upon the thyroid gland and the regeneration and pigmentation of hair in Peromyscus, R. R. Huestis and H. B. Yocom (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 121 (1930), No. 1–2, pp. 128–134, figs. 4; Ger. abs., p. 134*).—In this test adult individuals of the species *P. maniculatus* were injected intraperitoneally every fifth day with 0.05 mg. of thyroxin dissolved in sodium hydroxide and diluted with salt solution. The hair was clipped and removed from one side of the body by a depilatory paste. The results from the 61 test and control animals indicated that the thyroxin distended the follicles of the thyroid gland and increased the rapidity and extent of hair regeneration, though the regenerated pelage contained fewer hairs than were removed. Thyroxin did not affect the pigmentation of the regenerated hairs.

On the reproductive capacity of mice after hypophyseal implants, T. Martins (*Mem. Inst. Oswaldo Cruz, Sup. 12 (1929), p. 294*).—In studies with immature female mice in which sexual maturity was hastened by implantation of portions of the hypophysis, it was found that such females did not conceive when mated with mature males. Treating the females in this way, however, did not interfere with their ability to produce young normally when the age for normal sexual maturity was reached.

Preliminary investigation on the fecundity of premium stallions. A. Walton and T. K. Fair (*Jour. Agr. Sci. [England], 18 (1928), No. 4, pp. 772–777*).—Data are recorded on the quantity and quality of the semen recovered from mares after mating with seven stallions. Based on these data an attempt was made to predict the fertility of the stallions. The failure of certain stallions to ejaculate in apparently normal matings was pointed out as a possible cause of low fertility.

FIELD CROPS

[Crop production research in the Southern States] (*Assoc. South. Agr. Workers Proc., 29 (1928), pp. 16–19, 26–39, 69–95, 99–103, 105, 106, 107–109, 204–213, 255*).—Papers of agronomic interest presented at the convention of the Association of Southern Agricultural Workers at Memphis, Tenn., February 1 to 3, 1928, included Report of Cotton Production Council, by H. W. Barre (pp. 16–19); Adjusting the Quality of the Cotton Crop to Spinners' Requirements (pp. 26–38) and The Correlation of Research in Cotton Marketing (pp. 204–213), both by B. Youngblood; The More and Better Cotton per Acre Contest Points the Way to Profitable Cotton Production, by E. C. Westbrook (pp. 38, 39); Soil Erosion Studies, by T. B. Hutcheson (pp. 69, 70); Soybeans for Feed and Fertility, by W. J. Morse (pp. 71–74); Middle Tennessee Experiment Station's Pasture Project, by L. R. Neel (pp. 74–79); Fertilizer Injury to Cotton Observed in Field Work of the Georgia State College of Agriculture (abs.), by L. V. Davis (pp. 79–84); Varying Ratios of Phosphoric Acid, Nitrogen, and Potash under Cotton, by C. B. Anders (pp. 84, 85); Effects of Fertilizer and Lime, Used Alone and Combined, Compared with no Treatments during Nine Years (1918–1926) upon the Yield of Crops Grown in Rotation upon Dominant Coastal Plain and Piedmont Soils, by C. B. Williams (pp. 86–95); Southern Pineland Pasture Problems, by S. W. Greene (pp. 99–102); Boll Maturation Period in Cotton, by T. S. Buie (pp. 102, 103); Contacts That the Extension Agronomist Should Make, by O. S. Fisher (pp. 105, 106); A Seed Improvement

Program, by F. C. Ward (pp. 107–109); and The Effect of the Spacing of Cotton upon the Form and Height of the Plant, by W. E. Hinds (p. 255).

[Field crops work in Louisiana], H. B. Brown, H. Stoneberg, J. P. Gray, A. H. Meyer, J. R. Cotton, W. G. Taggart, E. C. Simon, and C. B. Gouaux, (*Louisiana Stas. [Bien.] Rpt. 1928–29, pp. 19–24, 57–62*).—Further agronomic investigations (E. S. R., 57, p. 522) are reviewed.

Cotton variety trials indicated Delfos to be the best staple cotton for alluvial lands, D. & P. L. No. 4–8 to be the best short staple, especially for the uplands of north Louisiana, and Dixie Triumph for wilt-infected soils. In station tests the best yields were had from 2 stalks in hills 20 in. apart and April 11 planting. Yields and plant heights did not differ apparently on deep, medium, and shallow plowing, although there was more shedding on the deep plowing.

On bluff land soil sodium nitrate and calcium nitrate surpassed other nitrogen carriers for cotton. Where superphosphate 300 lbs., sodium nitrate 150 lbs., and potassium chloride 50 lbs. was the basic fertilizer on this soil, nitrogen gave the greatest returns, consistent increases being had from up to 250 lbs. of sodium nitrate per acre, while phosphorous and potassium gave smaller increases. The returns from different nutrients in cotton fertilizer tests in different localities in the State are described briefly.

Cocke, Hastings, and Whatley prolifics, Yellow Creole, and Sentell White Dent led the corn varieties. Stalks 1 ft. apart in 4-ft. rows gave best yields on fertile alluvial lands. Corn on high beds and cultivated with a turning plow yielded slightly better than corn cultivated level. Corn yields were reduced 23.6 per cent when soybeans were planted in the same row, but the 3 tons of soybean hay made an estimated total acre value of $58, compared with $41.90 from corn alone. Corn and soybeans in every row made 40.7 bu. of corn and in alternate rows 36.6 bu. Fertilizers, even nitrogen, were not generally profitable on corn.

Biloxi-61, a station soybean selection, led the varieties in hay production and was followed in order by Otootan, Biloxi, Tanloxi, and Laredo. Sown in corn, 20 lbs. per acre of soybeans produced more green weight, 7.7 tons, than heavier seeding rates, while corn grain yields did not differ much.

The merits of seedlings and introduced varieties are noted, and varietal work on test fields in five localities in the sugar belt (E. S. R., 61, p. 636) are reviewed. With plant cane C. P. 807 surpassed all varieties in tonnage yields and compared favorably in sugar yields with P. O. J. 213. Co. 281, another new variety, was also outstanding. P. O. J. 213 again did well and was followed by P. O. J. 36–M and P. O. J. 36. P. O. J. 234, as usual, was lower in field yields but higher in sugar per ton yields. P. O. J. 213 led, followed by P. O. J. 36–M and P. O. J. 36 in the first year stubble results. In the second stubble comparisons P. O. J. 213 led in the alluvial section, while P. O. J. 36 was superior in the Teche and western sections.

Fertilizer tests and rotations with sugarcane continued to emphasize that legumes properly used are quite essential to soil fertility. Where one crop of legumes had been turned under before growing sugarcane, 36 lbs. of nitrogen per acre on stubble cane gave increased yields of about 10 tons, whereas with two crops of legumes turned under before the sugarcane, the same fertilizer on the stubble cane resulted in an increase of only 6 tons. In neither a 3-year nor 4-year rotation did fertilizer pay on plant cane, while nitrogen applied to stubble cane usually gave profitable returns. Where legume hay was removed from the field the crops which followed produced less in comparison with land where legumes were turned under, and this yield decrease was evident even where nitrogenous fertilizer was applied to the respective plats in the next crop. The stubble crop after Biloxi beans were turned under produced 2 tons more per acre than after cowpeas turned under. Corn after legumes made 17 bu. per acre more than corn grown after stubble cane, and corn after one crop of legumes turned under made 10 bu. more than after legumes harvested for hay. Sodium nitrate, followed closely by five other carriers, led the nitrogen sources for sugarcane, an increase of about 10 tons coming from an application of 36 lbs. of nitrogen per acre.

The bud and most of the eyes of P. O. J. Nos. 36, 213, and 234, according to the results of 1928, have to be completely killed by freezing weather before it is considered advisable to windrow cane for the mill. Sugarcane windrowed when the bud is still alive or partly killed will under average weather conditions deteriorate rapidly. Standing cane killed by freezes, with the bud and most of the eyes killed, will keep fairly well for about 15 days. Both standing and windrowed canes on black lands were observed to deteriorate more rapidly than on the lighter soil types, and windrowed cane in poorly drained lands also deteriorated rapidly. Canes high in sugar content are considered more resistant to freezes and to deteriorate less both standing and windrowed.

Results for 1929 showed that after the bud and most of the eyes of sugarcane have been killed by freezes the cane which must be milled after 15 to 18 days should be windrowed immediately after the freeze in order to keep fairly well. Cane windrowed 10 to 14 days after killing freezes for protection from extreme low temperatures was much better for milling than standing cane. P. O. J. 36 showed the greatest resistance to freezing and less deterioration, both when standing and windrowed. P. O. J. 213 plant cane, immature and usually badly bored, was damaged more by the freezes and showed the most deterioration both standing and windrowed. P. O. J. 234, naturally high in sucrose, was not damaged so much by the freezes and showed less deterioration than P. O. J. 213.

[Agronomic experiments in New Jersey] J. G. LIPMAN and H. B. SPRAGUE (*New Jersey Stas. Rpt. 1929, pp. 17–19, 303–314*).—Breeding work with corn, wheat, rye, oats, barley, alfalfa, and red clover; variety tests with the foregoing crops and timothy, potatoes, soybeans, cowpeas, and green manure crops for corn; comparisons with annual hay crops; and weed control experiments are reviewed again (E. S. R., 61, p. 724).

A preliminary test on the effect of X-ray treatment of seed-potato tubers (E. S. R., 61, p. 827) gave indications that the stronger dosages caused a decrease in the total number of marketable tubers, while the average weight per tuber and the total yield were greater from treated than from untreated seed. Seed stored at temperatures of from 70 to 75° F. for 1 week after cutting and then transferred to temperatures of from 50 to 55° appeared to lose less weight than cut seed retained for 3 weeks under cool conditions.

With Jerusalem artichokes grown on an acid sandy soil, lime increased tuber yields more than 100 per cent, and the percentage of sugar about 10 per cent. Manure, while not affecting yields of tubers, helped increase the sugar content. Fertilizer treatment relatively high in phosphorus and medium in nitrogen and potassium resulted in more sugar per acre than fertilization with high percentages of nitrogen and low of phosphorus. Sugar beets on sandy soils were practically a failure, irrespective of the soil treatment. Lime aided in the growth of tops but root development was poor on this soil type. However, on a silt loam soil heavily limed and manured 15 tons of roots an acre were produced.

Lead arsenate applied to turf as top-dressing at the rate of 15 lbs. per 1,000 sq. ft. controlled earthworms and aided in weed control. Continuous use of acid-forming fertilizers produced a harmful effect in developing excessive acidity, a condition counteracted by the use of small quantities of lime.

[Crop experiments] (*Rothamsted Expt. Sta., Harpenden, Rpt. 1927–1928, pp. 21–39, 124–153, 165–175*).—Experiments with potatoes (E. S. R., 58, p. 227) continued to show that neither ammonium sulfate or potassium sulfate gave its best effect without the other. With sufficient potassium and phosphorus the increases from the application of 1 cwt. of ammonium sulfate usually were around 20 cwt. of potatoes per acre. With enough ammonium sulfate supplied, the increases from 1 cwt. of potassium sulfate were much more variable. Late planting lessened the effect of potassium fertilizer, which depended much more on the season than did the nitrogen. Potassium sulfate usually excelled other potassium carriers for potato yields, although the chloride was very effective. The effect of superphosphate seemed to depend on the presence of sufficient nitrogen and potassium.

Continental fertilizer recommendations for sugar beets were not found wholly suitable for English conditions. The beet leaves behaved normally toward fertilizers, nitrogen deepening their color and increasing their size. An additional 1 cwt. of sodium nitrate gave about 1 ton more leaves per acre. The roots, however, were affected much less than the leaves and were not nearly so responsive as mangels. None of the nitrogenous fertilizers increased the yield much, while they all lowered the sugar content and the weight of root per 100 parts of leaf. Phosphate and potassium fertilizers had little effect either on yield or sugar content. The results suggested that sodium, and perhaps magnesium and chlorine, plays some part in sugar beet nutrition, and that unless they are supplied the plant can not make full growth. Compared with the sugar beets grown in 1871–1873 at Rothamsted, the 1928 roots were much richer in sugar, but the acre yields of roots and of sugar had decreased and the efficiency of the leaves had fallen considerably. The improvement apparently was mainly a reduction in size of root, compacting the sugar into a smaller space.

The response of barley (E. S. R., 58, p. 224) to 1 cwt. of ammonium sulfate per acre was greatest in years of low yield and least in productive years. The increments seemed to be affected by rainfall in spring sufficient to permit tillering proportionate to the nitrogen supply and enough sunshine in July to allow head formation, also proportionate thereto. Nitrogenous fertilizers evidently did best when applied at planting but were ineffective as top-dressing. Response to superphosphate varied with the locality. Indications were that in years favoring the formation of well-matured grain low in nitrogen, potassium sulfate may depress barley yields, whereas in seasons unfavorable to ripening a reverse effect of the sulfate may appear. The effect of fertilizer, especially nitrogen carriers, on the composition and quality of the grain is again discussed briefly.

Other activities reviewed briefly dealt with grassland experiments and the measurement of response of grassland to treatments, nitrogenous fertilizers for winter grain, the effect of fallowing on grain production, alfalfa production, and a new method of field experimentation.

[The Woburn field experiments, 1927 and 1928], J. A. Voelcker (*Rothamsted Expt. Sta., Harpenden, Rpt. 1927–1928, pp. 102–115, 154–164*).—The yields of continuous wheat and barley treated with various fertilizers and manures on Stackyard field are summarized for the period 1877–1926, inclusive. The plats were fallowed in 1927 and 1928 to remove the weeds and were to be resown to wheat and to barley for the 1928–29 season. Other activities reported on briefly included rotations and green manuring tests; grazing, manuring, and liming trials; fertilizer tests with potatoes, sugar beets, barley, and mangels; and an inoculation test with alfalfa.

[Agronomic investigations of the Agricultural Research Institute, Pusa, 1928–29], W. McRae, F. J. F. Shaw, J. Sen, J. H. Walton, W. Sayer, T. S. Venkatraman, and N. L. Dutt (*Agr. Research Inst., Pusa, Sci. Rpts. 1928–29, pp. 2, 4, 10–28, 32–35, 49, 78–92, 141–157, pl. 1*).—Experiments and breeding work continued with a number of important field crops (E. S. R., 59, p. 223) are reported on again.

Some observations on the nitrogenous manuring of grassland, H. W. Gardner, J. H. Smith, J. W. Reid, and H. R. Williams (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 500–523, fig. 1*).—The first two years of treatment of pasture with periodic dressings of nitrogenous fertilizer followed by rotational grazing at the Hertfordshire Institute of Agriculture are reported on, with special emphasis on the botanical and chemical composition of the herbage.

Pastures for spring and fall grazing in mountains of Colorado, H. C. Hanson (*Colorado Sta. Bul. 360 (1930), pp. 12, figs. 8*).—Preliminary recommendations are made for the establishment of pasture in the mountains for early spring grazing, and the behavior of grasses and legumes near the station, altitude about 5,000 ft., near Livermore 6,300 ft., and Virginia Dale 7,000 ft. is described. Location of the pasture, preparation of the soil, seeding, and proper management after planting evidently should receive considerable attention. A pasture mixture for cattle and horses, from 2 to 4 weeks earlier than native grasses and found suitable in several places for early pasturage, includes crested wheatgrass 4 to 5 lbs., slender wheatgrass 5, bromegrass 5, bulbous bluegrass 3, and yellow sweetclover 2 lbs., sown at the rate of 20 lbs. per acre. The mixture indicated for sheep is bromegrass 12 lbs., bulbous bluegrass 5, and yellow sweetclover 3 lbs., also at 20 lbs. per acre.

Legume bacteria with reference to light and longevity, W. A. Albrecht and L. M. Turk (*Missouri Sta. Research Bul. 132 (1930), pp. 19, figs. 5*).—Legume bacteria of both soybeans and red clover remained viable in Grundy and Eldon silt loams, regardless of whether the soil was air-dried in the sun or in the dark, and differences were not apparent in these soils in production of nodules when used for inoculation. Dried soils stored carefully retained viable bacteria for four years. Differences were not noticeable when the soils were limed and fertilized or when they were more fertile with reference to nitrogen and organic matter. Soils not dried retained viable legume bacteria and served as inoculating material for at least seven years during the absence of the particular legume host. Trials of stored bacteria originating from commercial cultures indicated that they can remain viable for a long time under conditions as drastic as in liquids in tightly stoppered bottles.

All the ultra-violet light coming from a mercury vapor lamp in quantities more than twice as great as that from the sun at noon in autumn was absorbed by a soil layer 0.1 mm. deep. Exposure of soil containing legume bacteria to strong ultra-violet light for varying periods of time evidently did not produce any detrimental effect to its inoculating power. Extended exposure to the ultra-violet light did not result in serious injury to commercial cultures in glass bottles. However, the legume bacteria were killed in less than 10 minutes when exposed in water cultures or on mannite agar. The absorptive capacity for ultra-violet light by glass or soil appeared sufficient to protect the bacteria from the bactericidal action of the sun.

Practical conclusions were that when legume bacteria are once well established in a soil through the growth and nodule production of their host plant they remain viable for a long time regardless of desiccation and exposure to sunlight. With soils maintained under field condition their longevity extends at least through seven years and probably longer. Evidently when once established in the soil the legume bacteria will not need to be introduced again as inoculation within periods common to most crop rotations.

The effect of fresh straw on the growth of certain legumes, H. G. THORNTON (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 3, pp. 563–572, figs. 2*).—Pot experiments with soybeans and horse beans showed that fresh chaff incorporated with the soil caused a significant increase in the number of nodules produced on inoculated plants, and this increase was augmented by the further addition of phosphates. Adding fresh chaff at the time of sowing and inoculation was more effective than chaff decomposing in the soil for a month and was found to depress the growth of the tops in soybeans without nodules, but this did not occur either with soybeans or horse beans with nodules present. In a field experiment at Rothamsted chaff freshly plowed in increased the growth of horse beans and also of wheat sown the next season on the same land.

An appended note by P. H. H. Gray reports that the chaff greatly increased the bacterial numbers whether added alone or with calcium phosphate. The phosphate stimulated multiplication at the start, especially where added together with chaff.

A new variety of alfalfa, T. A. KIESSELBACH, A. ANDERSON, and G. L. PELTIER (*Jour. Amer. Soc. Agron.*, *22* (*1930*), *No. 2, pp. 189, 190*).—Hardistan alfalfa, a superior strain from Dawson County, Nebr., in tests at the Nebraska Experiment Station gave yields approaching those of Grimm alfalfa, maintained stands superior to those of other varieties, and in 1928 contained 28 per cent of wilt infection as compared with 71 per cent in Nebraska common alfalfa and 67 in Grimm. Hardistan closely resembles common alfalfa in appearance and growth habits. Although believed to have originated in Turkestan, it does not have the specific vegetative characteristics of typical Turkestan alfalfa.

Alfalfa on the cut-over lands of northern Idaho, J. H. CHRIST (*Idaho Sta. Bul. 169* (*1930*), *pp. 11, figs. 5*).—Production practices for growing alfalfa on the cutover lands of northern Idaho are outlined from experiences and experiments at the Sandpoint Substation.

Both Grimm and common alfalfas have outyielded sweetclover and clover, and the hardier varieties, as Grimm, Hardigan, and Cossack, maintained good stands over four years and prevented encroachment of weeds and grasses. Seedings late in the spring, broadcast and without a nurse crop, have given good results. Cultivation with a spring tooth harrow was found to result in a slightly larger yield and to aid in controlling grass somewhat. Alfalfa responded to gypsum applications with about doubled yields, and sulfur likewise stimulated yield increase.

Influence of alfalfa on the change of virgin soils in the cotton districts of Armenia, KH. P. MIRIMANOFF (*Jour. Amer. Soc. Agron.*, *22* (*1930*), *No. 2, pp. 97–107*).—Prolonged culture of alfalfa, according to studies by the Central United Laboratory of Armenia, favorably influenced the change of virgin soils in the Echmiadzin region, typical of the Armenian cotton districts. After the alfalfa, an increase was observed in the silt and clay fractions, especially in the upper layers, in organic matter in surface layers, hygroscopic moisture, and in the nitrogen content in the first layer, whereas decreases were noted in carbon dioxide content and in nitrogen in lower layers. The physical properties of soils after cropping to alfalfa were considerably improved, due to increasing noncapillary porosity and the raising of the water capacity of the soil. In water extracts from soils in alfalfa the amounts of dissoluble salts decreased, due mainly to the decline of alkalinity. The amount of exchangeable cations greatly increased in the upper layers, due to the increasing amounts of calcium and potassium, whereas the amount of exchangeable sodium decreased remarkably.

Time of plowing brome grass sod in relation to the yield and quality of the succeeding wheat crop, R. Newton and J. G. Malloch (*Sci. Agr., 10 (1930), No. 9, pp. 607–611, fig. 1*).—Cultural experiments at the University of Alberta, supplemented by milling and baking tests, demonstrated that for conditions as at Edmonton bromegrass sod evidently should be plowed in July or early August and cultivated as needed to suppress green growth. As shown by the following wheat crop, this practice in an average year compared with later fall or spring plowings will insure more satisfactory control of the bromegrass and better yields and quality of wheat.

Castor seed: Its production and utilisation (*Bul. Imp. Inst. [London], 28 (1930), No. 1, pp. 30–46*).—Information is summarized on the culture, harvesting, insects and diseases, and uses of the castor-bean (*Ricinus communis*); the preparation and uses of castor oil and castor-bean cake; and the international commercial movement of the three items.

Louisiana corn varieties, H. B. Brown (*Louisiana Stas. Bul. 210 (1930), pp. 20*).—Variety tests with corn at the station and in different localities in the State showed Cocke Prolific, Hastings Prolific, Whatley Prolific, and Yellow Creole in order to average highest in yields. Sentell White Dent, best adapted to the northern half of Louisiana, did best among the one-ear varieties. The increase gained from the use of complete fertilizers was not enough in most cases to pay for the treatments. The effects of interplanting soybeans in corn are noted on p. 330. Improvement work with corn at the station and the characteristics of prominent corn varieties are described briefly.

Present position of cotton cultivation in Africa (*Internatl. Rev. Agr. [Rome], Mo. Bul. Agr. Sci. and Pract., 20 (1929), No. 3, pp. 104–112*).—A review of the current status of cotton production in Egypt, Anglo-Egyptian Sudan, Union of South Africa, and the Italian, French, British, and Belgian colonies in Africa. The bibliography includes 39 titles.

A note on the pollination of black and green grams in the Godavari District, M. Narasimham (*Agr. Jour. India, 24 (1929), No. 6, pp. 397–401, pls. 2*).—Although the structure of the floral parts in black and green grams (*Phaseolus mungo* and *P. radiatus*) indicated their suitability for insect pollination, self-pollination appeared to be common under Godavari conditions. Pure line selection in these crops appeared to be a possibility.

Kenaf, N. N. Balashev (*Trudy Uzbek. Selsk. Khoz. Opytn. Sta., No. 5 (1928), pp. 29–82, figs. 5; Ger. abs., p. 82*).—Kenaf (*Hibiscus cannabinus*) was found to resemble cotton in its temperature requirements up to seed maturity. The optimum time for planting was in late April to early May, and for harvest of fiber at beginning of seed maturity or slightly before, and the optimum spacing was in hills 3.5 in. apart with from 2 to 3 plants per hill in 90-cm. (35.4 in.) rows. Increase in density of stand was accompanied by reduction in diameter of stem, plant height, length of branches, and yield of fiber and seed per plant. The crop responded to applications of manure and cottonseed meal and to these materials with superphosphate.

Oat tests at the Michigan Experiment Station, E. E. Down, H. M. Brown, and F. H. Clark (*Michigan Sta. Spec. Bul. 197* (*1930*), *pp. 12, figs. 4*).—Wolverine, an early oats widely grown in Michigan and especially well adapted to the lighter loams and upland soils, and Worthy oats, well adapted to heavy mineral soils because of its ability to withstand lodging, are indicated of value for Michigan as the result of extensive variety tests. Several other varieties equaled but did not surpass Wolverine, and their use is not advised. Markton and Minota No. 512 also had certain merits. Smut tests in 1928 showed that all of the varieties tested, with the probable exception of Markton, are susceptible to loose smut, and the same is true of covered smut, with the possible exceptions of Cornellian and Markton.

Rice in the Union of Socialistic Soviet Republics and its chief varieties [trans. title], M. Brzhezitskiĭ (Brjezitzky), L. Kara-Murza (Kara-Moursa), and Z. Kanevskaia͡ (S. Kanevskaya) (*Zap. Semen. Kontrol. Sta. Narkomzema* (*Bul. Seed Control Sta. People's Commis. Agr.* (*Azerbaijan*]), *No. 3* (*1929*), *pp. 40; Eng. abs., pp. 37–39*).—Production practices in rice-growing districts in the Far East, Turkestan, and Transcaucasian Socialist Federal Soviet Republic are outlined, and important rice varieties are described briefly. See also earlier notes (E. S. R., 55, p. 134).

A classification of soybeans, W. C. Etheridge, C. A. Helm, and B. M. King (*Missouri Sta. Research Bul. 131* (*1929*), *pp. 54, pls. 3, figs. 10*).—The present classification places 134 soybean varieties in 20 groups mainly according to their morphological features, especially colors of seed, blossoms, and pubescence. Within the groups varieties are distinguished by cotyledon color, form and size of seed, hilum color and size, form, size, and color of pod, growth periods, height and form of plant, growth habits, and leaf character. The arrangement includes most of the systematic forms of the soybean now found in the United States. Type specimens of the seed of each variety are illustrated in color, and examples of pod color, shape and distribution, and plant habit are also depicted.

Effect of soil type and fertilizer treatment on the composition of the soybean plant, R. H. Austin (*Jour. Amer. Soc. Agron., 22* (*1930*), *No. 2, pp. 136–156*).—Analyses of periodically sampled soybeans grown by the Michigan Experiment Station in fertilizer tests on Brookston clay loam, Coloma sand, Kewanee loam, Fox sandy loam, and Miami loam demonstrated that the soil type upon which the soybeans grew was a greater factor in determining the composition of the plants than was the application of moderate quantities of fertilizer.

The total ash content of the plants was lowest 110 days after seeding, and often it was highest 73 days after seeding. In young plants high ash content was associated with smaller growth. The calcium, magnesium, and nitrogen contents of the plant decreased with the age of the plants. The sulfur content changed very little during growth or due to the influence of fertilizers or soil type differences. A tendency was suggested for the phosphorus content of the plants to increase during the latter half of the growing period. The potassium content was very irregular, but the variations were small. The fertilizer treatments did not affect the composition of the plant very much, being most effective in this respect on Coloma sand and least effective on Miami loam.

Greenhouse tests showed that the phosphorus and potassium contents of the cell sap of the soybean plants were increased by applications of phosphorus and potassium, and the contents of these elements and of calcium in the cell sap were affected by the type of soil upon which the plants grew.

The seed production of sugar beets, D. A. Pack (*Facts About Sugar, 25 (1930), No. 2, pp. 37–39, 48*).—Storage experiments, wherein mother beets were subject to various moisture and temperature conditions and variations, demonstrated that the optimum moisture conditions for storage of mother beets for maximum seed production is one under which the beets retain weight or gain slightly. This would be equivalent to about 7.6 atmospheres osmotic pressure. The optimum temperature to store mother beets for seed production appeard to be about 4.4° C. (40° F.). A constant storage temperature of 4.4° for mother beets seemed to be more favorable for seed production than the ordinary season's temperature of silos at Salt Lake City, Utah, i. e., 1 to 10°.

Studies of sugarcane roots at different stages of growth, T. S. Venkatraman and R. Thomas (*India Dept. Agr. Mem., Bot. Ser., 16 (1929), No. 5, pp. 145–157, pls. 10*).—Set roots, shoot roots, and the root systems of mature plants in a number of sugarcane varieties are described and illustrated, and aerotropism and adaptations for rooting efficiency are discussed briefly.

Modern seed testing, R. G. Stapledon (*Sci. Prog. [London], 24 (1930), No. 96, pp. 623–642*).—Current trends in the testing of agricultural seeds are discussed from a British viewpoint.

HORTICULTURE

[Horticultural investigations at the New Jersey Stations] (*New Jersey Stas. Rpt. 1929, pp. 31–35, 36, 37–39, 209–228, 229–242, 243–247, figs. 2*).—The usual annual report (E. S. R., 61, p. 733).

A nutrient solution adaptable to growing peaches in sand cultures was developed, and it was noted that the relative amount of branching of peach seedlings grown under controlled conditions in the greenhouse was a good index of the relative degree to which trees were able to obtain and use nitrogen. In the orchard peach trees without nitrogen fertilizers developed relatively small leaves and smaller, earlier ripening fruits. Nearly 1,000 of the peaches resulting from 1923 breeding fruited in 1928 and included some exceptionally promising kinds. A total of 1,166 trees of the 1927 crosses were set out in 1929, and 687 of the 1928 crosses were still in the nursery.

Poor growth of crimson clover and vetch cover crops was found due to high acidity. In the greenhouse peach and apple seedlings failed to grow well when the pH was below 5 and made their best growth at 6 or above. Believing that soil aeration is an important factor in plant growth, tomato plants reduced to a no nitrate condition were set in fine and coarse sand and grown without nutrients. The better growth was made in the fine sand.

Promising tomato seedlings were obtained from crosses between Marglobe and Campbell Late and Earliana. Individual records on 1,500 asparagus plants showed production ranging from 0 to 100 spears and also a wide range in the time of production. The existence of definite strains is suggested.

A pressure tester having a 0.25-in. diameter plunger and registering 0 to 500 gm. proved satisfactory for determining the maturity of strawberries.

Biochemical studies with beets and other root crops indicated that potash is essential to normal development. In extreme lack of potash the cambiums ceased to exist, the roots increased only slightly in diameter, and the potash was localized largely in the growing tips of the roots. Apparently potash was transferred from mature to embryonic tissue. In the tomato, with just enough potash to set one or two fruits per plant, practically all the potash was translocated to the fruits, and the growing points of the root and stem died, followed by a gradual collapse of the entire plant. The addition of potash at the time fruit was setting restored vigor. When potash was abundant it was found in all parts of the cell cytoplasm, but when limited was chiefly located in the opaque portion. Over 90 per cent of the total potash present was easily extracted from either fresh or dried tissue with cold water. In tomato plants not extremely deficient in potash considerable quantities of this element were found in the active cells of the young developing abscission layers, whereas plants greatly lacking in potash formed no abscission layer. A slight lack of potash in the tomato was followed by carbohydrate accumulation, thickening of the cell walls, and early setting of fruit, whereas a serious shortage had an opposite effect and caused a noticeable thinning of the cell walls of the mechanical and conducting elements of the xylem, phloem, and collenchyma, and, consequently, narrow stems. Inability to manufacture carbohydrates in these plants was not due to a lack of chlorophyll, as the foliage kept green until the last stages of the experiment. Soluble iron was also present, and it is believed that the lack of potash affected the synthesis of the simpler water-soluble forms of organic nitrogen to proteins.

Studies on the spray residue problem indicated that the time of applying arsenicals is more of a factor than the amount used, that is, sprays applied after July left the heavier residues, and suggests that for the later treatments dusts are more desirable. The problem of maintaining low residues was most difficult in apples ripening August 1 to September 24, since the fruits did not remain long enough to be cleansed by rain, nor did they gain sufficient size to reduce the proportion of residues by weight. Of various washes, dilute hydrochloric acid was by far the most efficient. No serious effect of hydrochloric acid on storage quality was observed. Some data are given on the cost of washing.

Miscellaneous data are presented by M. A. Blake on the blooming, foliation, fruit setting, etc., of various fruits and ornamentals and statistics presented on the results of peach breeding experiments.

Measurements taken by J. H. Clark and O. W. Davidson of the leaf area of spurs of Delicious apple trees in various stages of vigor from ideal to small showed that below a certain point Delicious spurs failed to set fruit buds or failed to set fruit if flowers formed. This condition was approached when leaf blades were less than 2 in. long. Under ideal conditions leaf blades were long, leaves thick and leathery, and resistant to drying when cut off. A chart for estimating the growth status of Delicious trees is presented. Commenting on the poor set of Stayman Winesap and Delicious apples despite no unusual weather conditions, the hypothesis is advanced that long duration of relatively low temperature may have inhibited nitrogen assimilation and transfer to the spurs. Early death of the leaves the preceding autumn is also deemed a possible factor.

Pressure tests by Davidson on immature apples of several varieties showed a considerable variation in both skin and flesh texture. In a single fruit greater pressure was needed to penetrate the skin of the blushed side, with no significant differences when the skin was removed.

Analyses by A. L. Weber of currants sprayed once with a Bordeaux arsenical mixture showed 0.175 grain of arsenious trioxide per pound of fruit on the most heavily coated bunches. Dipping in dilute hydrochloric acid reduced the residue below the required tolerance.

Notes are presented by Clark on the results of tests of various small fruits and on the time of bloom.

Blooming dates of shrubs are presented by C. H. Connors, who also reports that in seven crosses J. H. Hale yielded all male-fertile progeny, while other crosses gave varying percentages.

Studies by H. M. Biekart upon causes of calyx splitting in the carnation again indicated that the tendency to split is accentuated by high carbohydrates. Plants low in organic nitrogen and very high in carbohydrates had 94 per cent of split flowers, those moderately high in organic nitrogen and carbohydrates 66 per cent, and those high in organic nitrogen and relatively low in carbohydrates 35 per cent. Sufficient potash was obtained by the carnation in the process of its field growth to carry the plant through the forcing season. A nutrient solution made of calcium nitrate, ammonium sulfate, magnesium sulfate, and monobasic potassium phosphate gave the best results in sand cultures, the flowers comparing very favorably with commercially grown blooms.

Biekart, working with G. T. Nightingale, observed that there was very little difference in the size or quality of narcissus blooms in plants grown with high and minus nitrogen solutions. High nitrogen had a tendency to cause the original bulbs to split. Grown two years with minus nitrogen, narcissus had decidedly shorter leaves the second season, and the minus nitrogen bulbs grown with nitrogen the second year bloomed fully a week ahead of any other group. Chemical analyses of bulbs grown under different nitrogen treatments showed the high nitrogen bulbs to be high in protein and relatively low in carbohydrates. Apparently very small quantities of nitrate nitrogen were needed to influence decidedly the protein content of the bulbs.

Studies by L. G. Schermerhorn showed the highest yield of carrots and sweet corn from the use of a complete fertilizer.

Selective breeding studies with asparagus showed a considerable variation in the percentage of albino seedlings in the progeny of individual plants. In a fertilizer test, the maximum yield of first-grade spears was produced on the plat receiving 1,500 lbs. of a 5–8–7 fertilizer and 1,000 lbs. of common salt, all in the spring. In data taken on the number and diameter of spears of individual asparagus plants, no definite correlation was established between the diameter of the brush in autumn and in the succeeding spring. Roots from plants with an extremely large spear diameter, 18 to 22 mm., in the autumn had an approximate mode of 25 large, 11 small, and 8 dormant buds. Plants with a fall spear diameter of from 6 to 10 mm. had an approximate mode of 2 large, 56 small, and 46 dormant buds. As a rule, for each stalk on the plant in autumn there were produced 2.75 spears the following spring. Chemical analyses by Schermerhorn and Nightingale of asparagus plants grown in high and low nitrogen indicated that plant food is translocated from the tops to the roots until the tops are practically dead.

Substitutes for glass on hotbeds and coldframes, D. Comin and W. Sherman (*Ohio Sta. Bimo. Bul. 144 (1930), pp. 70–78, figs. 2*).—Comparing glass with various substitute materials, such as cloth impregnated with paraffin and wire screen with celluloid, it was found that glass is superior for growing most vegetable plants, parsley being an exception. Soil and air temperatures under the several materials were so nearly constant as to be deemed of no significance in results. Large differences were estimated in the quantity of light transmitted and are considered of much importance. The only advantage in favor of the glass substitutes was their materially lighter weight.

Sulphate of ammonia and nitrate of soda in a sod orchard, R. D. Anthony (*Pennsylvania Sta. Bul. 249 (1930), pp. 24, figs. 10*).—Experiments conducted over a 6-year period in a commercial sod-grown York Imperial apple orchard located near Saint Thomas with trees carefully paired on the basis of trunk circumference, height, and spread led to the conclusion that in orchards of moderate soil fertility the difference in results between nitrate of soda and ammonium sulfate are relatively insignificant. Under conditions of low soil fertility the nitrate may be more valuable because of the quicker response.

Differential response was obtained with relation to the time of application, suggesting that nitrate of soda and ammonium sulfate can not be considered as exactly equivalent; for example, with the fertilizers applied at the first sign of bud growth, both 5 and 10 lbs. of nitrate of soda were more effective than equivalent amounts of ammonium sulfate, both in increasing trunk growth and yield. However, when applied when the buds were opening 10 lbs. of nitrate produced practically the same result as its equivalent of ammonium sulfate. When single amounts of these materials were added in June to plats which received single and double amounts at the first application, ammonium sulfate was more effective than nitrate of soda on yield and to some extent on growth.

During the first two years, moderate applications of either substance were effective, but as the grass sod became thicker much larger applications were evidently needed to supply the nitrogen requirements of both the grass and the trees. This situation was especially true in bluegrass sod because of its thick, dense growth and suggests the need of shorter grass rotations.

Spray injury and fruit set, F. S. Howlett and C. May (*Ohio Sta. Bimo. Bul. 144 (1930), pp. 67-70*).—Tests conducted in 1927 and 1928 with Ensee and Grimes, two apples very susceptible to spray injury, indicated that spraying with lime sulfur from two to three weeks after blooming may reduce the set, even though there may be no outward manifestation of injury. In 1927 sprays caused statistically significant reductions in set in both varieties. In 1928, 1 to 60 and 1 to 100 lime sulfur caused slight fruit dropping in Ensee, while with Grimes the 1 to 100 dilution did not reduce set. The loss of fruit was not found sufficient to cause a material reduction in the crop, provided that the foliage was not visibly injured and that the varieties sprayed did not have an abnormally heavy first drop.

Cranberry and blueberry investigations, C. S. Beckwith and B. R. Fudge (*New Jersey Stas. Rpt. 1929, pp. 187, 188, 191-193*).—Again presenting (E. S. R., 61, p. 739) a report upon the long-continued fertilizer investigations with the cranberry, the authors state that nitrogen fertilizers in proportion to the size of the application materially increased yields. In the year covered by the report dried blood proved more effective than did nitrate of soda. In the quantitative study with complete fertilizer 528 lbs. per acre per year gave a larger increased yield than did larger amounts, although during the first 8 of the 10 years covered the larger quantities had been more effective.

Low yields were obtained in the water level experiment because of resanding injury and generally low production. The best average yields were secured where the water was held from 3 to 9 in. below the surface, and the best growth was made on the 6- to 9-in. plats.

Studies of ripening changes in harvested cranberries showed no color increment at temperatures between 33 and 34°, even in light. At temperatures between 55 and 60° excellent color was produced. Berries did not keep well for 21 days at temperatures of from 68 to 77°. At the same time berries left on the vines became fully colored and had good keeping quality. Freezing of berries simply broke down tissues and permitted the red pigments to diffuse into the juice. The color of the extracted juice was directly proportiontal to the color of the fruit.

The production of hyacinth bulbs, D. Griffiths (*U. S. Dept. Agr. Circ. 112 (1930), pp. 35, figs. 19*).—A comprehensive discussion upon the culture, propagation, and forcing of the common garden hyacinth, laying particular stress on the various features involved in the artificial propagation by wounding of the bulbs. It is emphasized that the technicalities involved in artificial propagation are not such that they should discourage the intelligent grower.

DISEASES OF PLANTS

Plant pathology (*Louisiana Stas.* [*Bien.*] *Rpt. 1928–29, pp. 52–57*).—Tests conducted by C. W. Edgerton and E. C. Tims of several tomatoes for wilt resistance showed Louisiana Red and Louisiana Pink to be highly resistant as measured in yields on wilt-infested soil.

As determined by Tims, a delay in harvesting sugar beets may cause serious losses from Sclerotium wilt if warm weather intervenes. Neither fertilizer nor lime had any beneficial effect in reducing this wilt.

Progress was made by Edgerton, Tims, and P. J. Mills in the selection of sugarcane strains with considerable tolerance to the mosaic disease. Tests conducted in 1929 to determine the effect of mosaic on certain commercial sugarcanes showed no significant differences in yield between plants grown from healthy and diseased seed.

Finding the leaf midribs of certain canes to be attacked by what was apparently red rot disease, cultures of the leaf disease were obtained and inoculations made on the stems. Certain varieties of sugarcane were found very susceptible to the pokkah boeng disease. Two bacterial diseases designated as (1) mottle stripe and (2) red stripe and top rot were studied by Edgerton and [W. N.] Christopher concerning their pathogenicity on various varieties.

Certain species of Pythium were found by [H. H.] Flor to be associated with a root rot of sugarcane. The optimum growth of these Pythium species occurred at about 30° C., while at 36 and 15° growth was very slow. On corn, however, the greatest injury occurred at 25° and below. High moisture content of the soil tended to increase Pythium injury to corn. The optimum pH for the growth of Pythium was between 6.0 and 8.5. No evidence was secured that inorganic salts or soluble toxins are concerned in the root rot problem. Washing the soil had no effect on the growth of sugarcane, but steaming the soil made conditions more favorable for rapid growth. Two species of nematodes were found in small quantities in sugarcane roots, and a root pitting insect caused some injury to plants growing in steamed soil. *Rhizoctonia* sp. produced discolored lesions on the roots, but did not appreciably reduce growth.

None of the various chemical compounds applied to the soil affected with root rot disease had any perceptible effect on the growth of cane or on the prevalence of Pythium on the roots. The addition of ammonium sulfate and liquid ammonia did increase corn yields. A combined treatment of ammonium sulfate and Uspulun resulted in a 12-bu. increase per acre.

Edgerton and T. C. Ryker found that from 65 to 70 per cent of the sugarcane roots are located in the upper 8 in. of soil, and approximately 90 per cent in the upper 14 in.

Leaf spot and leaf scorch of strawberries were effectively controlled by A. G. Plakidas by several sprayings with 4–4–50 Bordeaux mixture. The addition of ammonia to the Bordeaux mixture did not influence the results.

Systematic roguing and selection gave satisfactory control of the dwarf disease of the strawberry.

Root rots which inhibit the growth of strawberries were checked in the greenhouse by the use of lime. Root knot, on the other hand, caused but little damage because strawberries are reset annually and make their growth during the cold season when nematodes are inactive.

Plant pathology (*New Jersey Stas. Rpt. 1929, pp. 39–43*).—As reported in the preceding year (E. S. R., 61, p. 741), excellent control of anthracnose of black raspberries was obtained by applying a delayed dormant application of 1–20 concentrated lime sulfur followed by a preblossom treatment of 2.5–4–50 Bordeaux mixture. For some undetermined reason the sprayed raspberry plants suffered more injury from extreme heat during the ripening period than did the controls.

Applying organic mercury disinfectants with the fertilizer increased the percentage of scab-free potatoes as compared with controls consisting of treated and untreated seed. Organic mercury compounds were as effective as mercuric chloride in the control of soil-borne scab, and they slightly increased yields. Certified seed yielded more potatoes and healthier plants than did uncertified seed. Rhizoctonia-infected seed stock planted 1, 2, and 4 in. deep produced more diseased sprouts as depth increased.

Heavy applications of complete fertilizers materially reduced root-rot injury to peas.

Eggplant wilt injury was greater on neutral or slightly acid soils than on acid soils. Some evidence was seen that eggplant varieties differ in their susceptibility to wilt.

Copper carbonate and certain organic mercury compounds used on seed of cucumbers planted in a Pythium-infested soil materially increased germination. Bordeaux mixture was beneficial in reducing damping-off of seedling cucumbers.

Acidulated mercuric chloride was found effective in the control of hard rot of gladiolus corms. Hot mercuric chloride treatments at 50° C. for 15 minutes with or without acid gave effective control. Ethyl mercuric chloride applied as a dust to corms caused severe injury but when applied on the soil over the corms was beneficial. Chlorophenol and nitrophenol mercuries did not control hard rot, and late planting had no material effect.

The rhododendron wilt organism was found to grow rapidly between 20 and 30° and between pH 5.0 and 7.8, with the upper alkaline limit not determined. Organic mercury compounds with an acid carrier are considered promising as controls. Formaldehyde and sulfuric acid soil treatments gave excellent but temporary protection. *Pestalozzia macrotricha* was found to be a weak parasite of the rhododendron, gaining access through injured tissues.

Infectious chlorosis of the rose was found to be widely distributed in greenhouses, occurring naturally on domestic Manetti stock but not on multiflora, odorata, Texas Wax, or Ragged Robin. The disease was transferred experimentally to healthy roses by means of buds and grafts.

Brown canker was found to be a serious disease of roses of some types. Sulfur-lead dust and Bordeaux mixture failed to give satisfactory control of brown canker.

Cane infections from black spot were observed in six hybrid tea roses and on certain other types.

Report of the department of plant pathology, W. H. Martin et al. (*New Jersey Stas. Rpt. 1929, pp. 249–272, figs. 2*).—A progress report (E. S. R., 61, p. 742).

New Jersey plant diseases, 1928, W. H. Martin (p. 249).—Brief statements are given of the plant disease situation in New Jersey in the period covered by the report.

Influence of Bordeaux mixture on transpiration, W. H. Martin and E. S. Clark (pp. 249–255).—Working with potato plants growing in 2-gal. pots where the water content of the soil could be maintained and evaporation prevented by a paraffin covering, evidence was found that increased water loss follows spraying with Bordeaux mixture. The greatest increase occurred during the night hours, and the accelerating effect of the Bordeaux mixture film was of short duration. A second application of Bordeaux mixture resulted in no change in the transpiration rates as compared with unsprayed plants. Spraying with water following two applications of Bordeaux mixture increased transpiration, whereas water spray alone exerted no stimulus. No day increase resulted from the use of Bordeaux mixture in the 15 per cent water-content series, but increases were noted in the 30 and 50 per cent lots.

Potato spraying in 1928, W. H. Martin (pp. 255, 256).—Bordeaux mixture 5–7–50 appreciably reduced the injury to potato plants from flea beetles and leafhoppers, but calcium arsenate had no beneficial effect. No differences were detected in the control value of Bordeaux mixture applied with 150, 250, and 350 lbs. of pressure.

Sweetpotato disease studies, W. H. Martin (pp. 256–260).—Testing the effect on stem-rot losses of planting 1, 2, and 3 plants per hill, the yield of prime potatoes was increased 18.8 per cent above the 1 plant per hill yields where there were 2 plants per hill, while with the 3 plants there was a decrease of 7.8 per cent. The gain of the 2-plant series is ascribed to the increased number of plants rather than to disease control. Of several varieties and strains tested for yield, the Gold Skin sweetpotato was the most productive.

Comparing mercuric chloride with certain organic mercury compounds for controlling scurf on sweetpotatoes, the results as measured by scurf control were in favor of mercuric chloride, but the organic mercury materials are deemed promising, since they were apparently less injurious as measured in the number of sprouts and were simpler to use.

Orchard disease investigations, W. H. Martin and E. S. Clark (pp. 260–262).—In addition to rendering service to growers by determining the date of maturation of the ascospores of apple scab, spraying experiments were conducted at Bridgeton on Stayman Winesap and Winesap varieties and showed that the preblossom sprays are of extreme importance in the control of scab. The delayed dormant application was of greater value than the prepink. Where both of these sprays were omitted there was 48.9 per cent of clean fruit, where the delayed dormant was omitted 69.2 per cent, and with prepink omitted 84.4 per cent. No material difference was observed in the value of delayed dormant, pink, and petal fall sprays.

Sulfur sprays or dusts were not as successful as Bordeaux mixture for controlling fruit spot.

Effect of various fertilizers and different methods of application on germination of peas (Pisum sativum), C. M. Haenseler (pp. 262–270).—Various fertilizer treatments were found to exert considerable injury to peas during the germination period. Inorganic nitrogenous salts were most liable to cause injury, while the superphosphates were practically harmless, and muriate of potash caused some injury. In respect to position, fertilizer placed above the seed caused the most injury. Observing that fruit injury was roughly proportional to the amount of nitrogen in the mixture, the authors suggest that the larger the nitrogen content the greater the care necessary in applying the fertilizer. In equivalent amounts highly concentrated fertilizers were no more injurious than were low analysis mixtures. Safe methods of using fertilizers are suggested.

Juniper blight, R. P. White (pp. 270–272).—Observing that losses approximating 25 per cent are common in nurseries from attacks of juniper blight (*Phomopsis juniperovora*), records were taken on the susceptibility of various species of juniper and on the value of various preventive treatments. Certain sprays gave considerable protection, and a program consisting of the removal of diseased branches supplemented by spraying is outlined.

Chlorosis—yellowing of plants: Cause and control, F. B. WANN (*Utah Sta. Circ. 85 (1930), pp. 12, fig. 1*).—A general discussion of the causes and control of a nutritional disease, chlorosis, which is a serious problem in Utah. A lack of iron in the plant resulting from certain soil relationships, notably the presence of considerable lime, a substance which apparently prevents the iron of the soil from dissolving in the soil solution, is deemed a potent cause of the trouble. Two methods of control are suggested, (1) supplying iron to the plant by spraying or by actual injection into the plant body, and (2) soil treatment consisting of the addition of manure, ammonium sulfate, or sulfur.

Some plant disease problems in the vegetable greenhouse, A. G. NEWHALL (*Ohio Veg. Growers' Assoc. Proc., 13 (1928), pp. 37–43, fig. 1*).—In addition to root knot, at least three major diseases of tomato are more or less serious in northern Ohio, namely, the Grand Rapids disease or bacterial wilt (*Aplanobacter michiganense*), tomato streak (now considered to be a double mosaic), and Cladosporium leaf mold. Recent findings are cited.

Alfalfa wilt in Nebraska, G. L. PELTIER and J. H. JENSEN (*Nebraska Sta. Bul. 240 (1930), pp. 35, figs. 10*).—Stating that alfalfa wilt (*Aplanobacter insidiosum*) has been an important factor in decreasing alfalfa acreage in Nebraska, the authors describe the disease manifestations; discuss the manner of infection, spread, etc.; and suggest methods of control. Losses were most serious in the irrigated and subirrigated valleys, surface irrigation, drainage water, and the cutting bar of the mower being apparently important agents in dissemination.

Diseased plants were dwarfed and yellowed and showed a bunchy appearance due to the many and shortened stems. The outer bark of the taproot of diseased plants was yellow or brown. The greatest mortality occurred in the second season after infection, and the plants were usually attacked when two years of age or older, rarely in the first year under field conditions. Bacteria are believed to enter the plants solely through wounded tissues.

Concerning resistance, all regional strains of common alfalfa were found susceptible, with Grimm equally so. The Hardistan, Turkestan, and Provence varieties appeared tolerant or resistant. Pending the development of resistant types, practical control suggestions are offered.

Inheritance of Fusarium resistance in cabbage, J. C. WALKER (*Jour. Agr. Research [U. S.], 40 (1930), No. 8, pp. 721–745, pl. 1, figs. 2*).—In crosses made between lines of All Head Early and Glory of Enkhuizen selected for resistance and for susceptibility to *F. conglutinans*, the segregation in the F_2 generation was very close to the theoretical Mendelian ratio of 3 resistant to 1 susceptible, indicating that resistance is governed by a single dominant Mendelian factor. This theory was supported by the results of back crosses between F_1 hybrid plants and the susceptible parental strain, which segregated close to the 1:1 ratio.

Studies of the Jersey Wakefield and Copenhagen Market varieties and of wild cabbage gave further evidence that resistance to yellows is controlled by a single gene. No indication was seen that resistance to yellows was linked with any important type character. Self-pollination is suggested as a means of removing partly susceptible plants from cabbage stocks, which in the ordinary procedure are maintained by mass selection in the field.

Celery spraying and dusting, J. D. WILSON (*Ohio Veg. Growers' Assoc. Proc., 13 (1928), pp. 92–102*).—This paper deals mainly with control of celery diseases by dusting, both that and spraying being done with hand equipment.

Of the celery blights discussed with tabulation according to causation (late blight by *Septoria apii*, early blight by *Cercospora apii*, and bacterial blight by *Bacterium apii*), usually late blight alone causes marked reduction in yield. Early blight may actually appear later than late blight. Bacterial blight, though less common than other forms, may be locally severe. All three blights may be controlled by timely and proper use of Bordeaux mixture in spray form or by copper lime dust. The first application should be made when the first leaf forms and (from two to four times in the seed bed) thereafter as new growth exposes new surfaces to infection. Costs are estimated, as are also control and yield percentages.

Seed corn treatments at the North Platte Substation, 1929, L. L. Zook and N. E. Jodon (*Nebraska Sta. Circ. 38 (1930), pp. 4*).—Of nine seed treatments tested, none were materially beneficial, and in fact seven gave somewhat reduced yields as compared with untreated lots. The differences that were obtained are ascribed to soil variations and other environmental factors rather than to the seed treatment.

Potato diseases in Montana, H. E. Morris and P. A. Young (*Montana Sta. Bul. 227 (1930), pp. 51, figs. 25*).—Preceded by a key, general information is presented as an aid to the identification of the more important potato diseases, describing the manifestations and the nature of the diseases and suggesting control treatments. The effectiveness of roguing seed plats as a means of reducing virus diseases was shown in the case of Netted Gem and Burbank stocks, which in 1927 lost, respectively, 21 and 23.2 per cent of the plants in roguing and 2.3 and 0.39 per cent in 1928. Similar studies with Bliss Triumph and Netted Gem potatoes planted on the tuber unit basis showed that this method of planting facilitated roguing. Tabular data are presented, showing the material reduction in yield of Bliss Triumph, Irish Cobbler, Netted Gem, and Idaho Rural potatoes caused by virus troubles.

A review of literature dealing with the degeneration of varieties of the potato, W. D. Davidson (*Roy. Dublin Soc. Econ. Proc., 2 (1928), No. 21–22, pp. 331–389*).—This review of the literature of potato degeneration extends to cover 109 references to publications dated 1730, 1756, and years thereafter.

A new Verticillium causing potato rot [trans. title], F. H. van Beyma Thoe Kingma (*Meded. Phytopath. Lab. "Willie Commelin Scholten," No. 12 (1928), pp. 31–35, figs. 3*).—A fungus causing a potato rot is described as the new species *V. foexii*.

Efficiency of organic mercury compounds in potato seed treatment, W. H. Martin (*Ohio Veg. Growers' Assoc. Proc., 13 (1928), pp. 19–23*).—The organic mercury dip treatment has proved to be a simple and efficient method of disinfecting seed potatoes, the organic mercury compounds used giving satisfactory results at from 1 lb. to 10 pints to 1 lb. to 40 pints of water. "With the present materials best results will follow their use at a concentration of 1–20, i. e., 1 lb. to 20 pints of water."

The sugar-beet leaf-spot disease and its control by direct measures, G. H. Coons, D. Stewart, and F. G. Larmer (*U. S. Dept. Agr. Circ. 115 (1930), pp. 20, figs. 7*).—Describing the life cycle of the disease caused by *Cercospora beticola* and its manifestations on the sugar beet plant, the results are presented of several control experiments conducted in the Arkansas Valley district near Rocky Ford, Colo. Five applications of copper sulfate-lime dusts in 1925 gave better control of leaf spot than did liquid sprays and were also more satisfactory because of the lighter machinery required and of the difficulty in obtaining clear water. Tests in 1926 and 1927, years of light attack, showed no significant gains from either dusting or spraying. However, in

1928, an epidemic year, dusts were again more effective than liquid sprays measured both in yield and in financial returns. Three or more applications of dusts at the rate of 35 lbs. per acre per application produced profitable results.

Breeding tobacco for resistance to Thielavia root rot, J. JOHNSON (*U. S. Dept. Agr., Tech. Bul. 175 (1930), pp. 20, figs. 11*).—Experiments conducted in cooperation with the Wisconsin Experiment Station showed that the F_1 progeny of crosses between resistant and susceptible plants is more or less intermediate in resistance. In the F_2 generation segregation occurred into types of varying degrees of resistance, ranging from that of the resistant to that of the susceptible parent. In the F_3 certain individuals continued to vary as in the F_2, while others apparently bred true. Susceptibility is considered to be the recessive condition.

Various environmental factors, particularly soil temperature, were found to influence resistance. The time of maturity was also a factor, the early maturing susceptible varieties being usually most seriously affected, and the late maturing susceptible varieties often showing partial recovery. Apparently the inheritance of disease resistance did not follow any simple Mendelian ratio but behaved more as would be expected in the multiple-factor hypothesis. The development of two root rot resistant commercial varieties is described.

Tomato leaf-mould, T. SMALL (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13 (1927), pp. 46–51*).—This report presents the results of variety tests and preliminary experiments to determine the conditions most favorable to the development of leaf mold (*Cladosporium fulvum*) of tomato plants.

Of the 200 tomato varieties tested for resistance, Sterling Castle, Up-to-date, Norduke, Maincrop, Satisfaction, and Frogmore Selected showed some resistance, but all produced low-grade fruit, so crossing with other varieties was projected. The last three named showed less resistance in October than in July.

The disease progressed most rapidly in July and August, when the temperature ranged around 74° F. and high humidity (above 70 per cent) prevailed. The disease developed rapidly at 74 to 81°. At 50 to 55° the progress was scarcely noticeable after three weeks.

Tests tabulated suggest that once the fungus becomes established its development within the plant is apparently unaffected by the water content, though of plants not placed in a moist chamber the turgid ones developed the disease most severely. Three days in a moist chamber after inoculation favored the disease far more than daily atomization with water.

"Mosaic" disease of the tomato, W. F. BEWLEY and W. CORBETT (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13 (1927), pp. 51–59*).—The chief danger to a tomato crop from mosaic lies in its effect upon the weak top growth. Aucuba mosaic is more severe than ordinary mosaic, as it injures the foliage more and by mottling the fruit reduces its market value. In commercial nurseries both the extent and severity of the disease are increased by a high water table, and especially by stagnation in the body of the water. Stripe may in hot weather follow mosaic appearing in March. Plants attacked by stripe may outgrow it if supplied with suitable dressings of potassium sulfate. Experimentation with each of these three diseases is tabulated. Some plants inoculated with extract from plants showing aucuba mosaic developed aucuba mosaic only, some also stripe. Similarly, ordinary mosaic resulted in mosaic only, stripe only, or a combination of the two. Of plants inoculated with extract from stripe plants, some developed stripe, some ordinary mosaic, some both diseases. Extract from a stripe plant, when heated for 10 minutes at 80 to 90° C., lost its capability to transmit mosaic.

A case of tomato injury on a commercial nursery, W. F. BEWLEY and W. CORBETT (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13 (1927), pp. 109–116*).—In case of the failure of a nursery tomato crop in connection with mottling and drying of the foliage, browning of the stem and petioles in patches and injury to the roots, conditions not transmitted by inoculation or grafting, these were traced to the presence of something injurious in the nursery soil which could be removed by igniting the soil, by autoclaving at 140° C., and by repeated washing. Other plants showed similar symptoms on cultivation in the nursery soil.

The effect of some compounds on Verticillium wilt of the tomato, P. H. WILLIAMS (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13 (1927), pp. 38–41*).—It has been known for some years that tomato sleepy disease (*V. alboatrum*) can be controlled by maintaining a temperature of 77° F., shading the houses, and replacing root watering by overhead damping. This treatment is entirely satisfactory when many of the plants in a block are diseased, but with a recent decrease in the intensity of the disease there has arisen the need for a method of treating individual plants or small groups without interfering with the normal cultivation of the rest. With the object of finding such alternative treatment, substances have been applied to the soil around diseased plants, and the results are here tabulated.

Of several substances applied which showed a favorable influence, the most promising results were given by potassium permanganate, ferrous sulfate, and a 50-50 mixture of magnesium carbonate and lime. Ammonium carbonate and Cheshunt compound appeared to be beneficial, giving the greatest effect at the lower concentrations. Calcium chloride was beneficial at low concentrations only.

Some aspects of sulphur dusting and spraying, H. C. YOUNG (*Ohio State Hort. Soc. Proc., 61 (1928), pp. 34–39*).—Tabulated results are presented of experimentation to ascertain the protective rôle of lime for scab spores in lime sulfur fungicidal spray combinations in Ohio apple orchards.

Scab spore germination increased with increase of lime percentage. The ineffectiveness occurred at temperatures between 45 and 69° F., which are favorable for scab and which usually prevail during periods of severe infection. The strongly adhesive quality of high lime sulfur dusts was confirmed, but the fungicidal value was shown to be lowered. "The evidence seems rather conclusive that lime reduces the fungicidal property of sulfur during periods favorable for infection. We were curious to know why this was true, so we attempted to extract the toxic factor of sulfur and see what chemical effect basic materials had on it."

Calcium hydrate was found to join chemically with the toxic factor of sulfur, the latter being again released when in a slightly acid medium. The only toxicity due to lime alone was in its alkalinity effect. It is thought that sulfur forms a coating over the parts treated, so that the germinating spore can not penetrate to the leaf tissue, its effects in other respects being slight. Attempts to initiate or approximate the effect of the climatic factor, water, showed that under conditions of severe scab infection the loss of sulfur accounts for the failure of dusting to protect.

It is thought that lime sulfur, still the standard spray material for the control of apple scab, should be used as a preblossom application at dilution 1:40; for a postblossom spray, 1:50 or 1:60, with 3 lbs. of hydrated lime to prevent burning if the scab has been adequately controlled in the spring.

Spraying and dusting experiments of 1927, F. H. BALLOU and I. P. LEWIS (*Ohio State Hort. Soc. Proc., 61 (1928), pp. 61–70*).—Pursant to the report presented in 1927 (E. S. R., 58, p. 248), the present detailed and tabulated account records the attainment of almost perfect protection from apple blotch and apple scab at a total cost per bushel of 7.4 cts. in 1927 as against 9.9 cts. in 1926. It is emphasized that thoroughness in dusting is as essential as in spraying to uniformly good results.

The timing of apple scab sprays, C. May (*Ohio State Hort. Soc. Proc., 61 (1928), pp. 77–79*).—The three factors determining timeliness in spraying against apple scab are, first and probably least, the developmental stage of the tree; second, the development of the scab fungus; and third, the relation of weather conditions to fungus infection. "The critical time to apply the scab sprays can not be judged by the condition of the tree alone, the two other factors must be taken into account. We have found in the past four years that sometimes it has been the delayed dormant, sometimes the prepink, and sometimes the pink, and in one case at least an application in bloom that has been most important."

Effect of the apple strain of the crown-gall organism on root production, E. A. Siegler (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 8, pp. 747–753, figs. 5*).—Inoculation of the cut ends of vegetatively produced shoots and of the bases of seedlings of the apple with the apple strain of the crown-gall organism which produces the woolly-knot type of crown gall resulted in the inhibition of root production and retardation of growth. However, since excessive root development frequently results from inoculation at other points on the shoots, it is doubted whether the organism in itself has either root-stimulating or root-inhibiting powers. The author suggests the possibility that the organism may cause a girdling action when inoculated at a point some distance from the base, and thereby cause root stimulation as occurs in ordinary girdling.

"Sour sap" in trees of the genus Prunus, M. C. Goldsworthy and R. E. Smith (*Science, 71* (*1930*), *No. 1846, pp. 506, 507*).—The authors describe a condition of stone-fruit trees in California which is locally known as sour sap. The name refers to a condition of the bark or cortex region of affected trees which is attended by decided souring and death of this portion of the host. The disease is said to be primarily one of winter or early spring. Trees that appeared to be in perfect condition at the end of the season either failed entirely to start growth the following spring, lost one or more of the main limbs, or lingered along into the summer only to die before the end of the season.

Two distinct souring diseases of trees of the genus Prunus have been recognized, one of which is said to be caused by bacteria, and one due to the presence of stagnant soil water which affects the roots during the early growing period of the host. Both types of diseases are briefly described.

According to the authors, many trees affected with sour sap of either of the above types become also infected with bacterial gummosis, which further complicates the question of the primary etiology of the trouble.

A disease of the strawberry plant, T. Small (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13* (*1927*), *pp. 45, 46*).—This disease, first observed under glass in 1925, was shown to be caused by *Diplodina lycopersici*. Apparently the disease originates where the plant is in contact with the soil, which is supposed to be the main source of the disease. Infection occurs over a wide temperature range, but is most destructive at about 15° C. (59° F.). Copper sulfate 0.4 per cent, Cheshunt compound 0.32 per cent, and Uspulun 0.25 per cent, each in sufficient quantity to saturate the soil, failed to destroy the infective material.

Non-infectious chlorosis of the strawberry (*New Jersey Stas. Rpt. 1929, pp. 228, 229*).—As reported by J. H. Clark, an unidentified disease caused a peculiar greenish-yellow striping of the leaves of the Eaton strawberry. Just before the fruit was ready to pick many of the leaves withered and died, and occasionally an entire plant succumbed. The fruit was worthless. Later the disease was observed on certain other varieties but not to such a serious extent. Apparently the disease was not transmitted from one variety to another in the field, giving some suggestion of inherent genetic weakness. The removal of all plants of an affected variety is deemed the only satisfactory control.

[Cranberry disease investigations], C. S. BECKWITH and B. R. FUDGE (*New Jersey Stas. Rpt. 1929, pp. 189–191*).—Closing a 6 years' study (E. S. R., 61, p. 747) upon the effect of Bordeaux mixture on the control of rot in cranberry bogs, the authors report that Bordeaux mixture reduced the percentage of rot and increased the yield per acre but had a harmful influence on the growth of the succeeding season. Apparently copper residue accumulated in the upper half inch of soil and injured the beneficial fungi which grow on the cranberry roots. Determinations showed that from 75 to 90 per cent of the copper was retained in the surface half inch of soil. The authors believe that under New Jersey conditions 4 or 5 years of careful spraying does not seriously affect the growth of vines and is often sufficient to correct the rotting tendency.

Notes on fruit decays of the feijoa (Feijoa sellowiana Berg.), W. T. HORNE (*Calif. Avocado Assoc. Yearbook, 1927, pp. 31–33, figs. 2*).—It is stated that the most menacing feijoa decay fungus is *Botrytis cinerea*, the second in importance being *Penicillium expansum*. The withertip fungus (*Colletotrichum gloeosporioides*) produces a very striking rot, here briefly described.

Powdery mildew of the carnation, H. L. WHITE (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13 (1927), pp. 43, 44*).—Carnation mildew (*Oidium* sp.) was reported to be widespread, appearing this season for the first time in some districts. Ammonium polysulfide, leaving no deposit on the foliage, is deemed preferable to lime sulfur.

A new "wilt" disease of the carnation, W. CORBETT (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13 (1927), pp. 42, 43*).—Late in 1926 young stunted and wilted carnation plants revealed a disease supposedly new. Of *Alternaria* sp. and *Clonostachys araucaria* isolated, the former alone proved to be pathogenic. The mode of infection and the size of the spore differentiate this fungus from *A. dianthi*, which is, however, suggested by the appearance of the spots. Experimentation was continued.

A bacterial disease of the chrysanthemum, P. H. WILLIAMS (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13 (1927), pp. 32–38*).—The author describes, with record of experimentation and discussion, a disease of chrysanthemum caused by a bacillus and characterized by a rotting of the upper flower stalk and consequent falling over of the flower head.

Botrytis stem rot of the rose, P. H. WILLIAMS (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13 (1927), pp. 41, 42*).—A parasitic strain of *Botrytis* sp. noted to attack roses causes a superficial brown scar on the flowering shoot, eventually girdling it and causing it to fall over. Pure cultures, easily obtained, caused the characteristic effects. Supposedly, high humidity or water drops are necessary to the development of the disease. Dead tissues should be removed.

Botrytis diseases of flower-bulb plants and peonies [trans. title], J. WESTERDIJK and F. H. VAN BEYMA THOE KINGMA (*Meded. Phytopath. Lab. "Willie Commelin Scholten," No. 12 (1928), pp. 1–27, pls. 3, figs. 10*).—The variable spring climate of the Netherlands favors greatly the development of Botrytis diseases of flower-bulb plants and peonies, the present account dealing separately with *B. tulipae*, *B. narcissicola*, *B. galanthina*, *B. hyacinthi* n. sp., *B. polyblastis*, *B. elliptica*, and *B. paeoniae*.

Pencillium corymbiferum on tulip bulbs [trans. title], F. H. VAN BEYMA THOE KINGMA (*Meded. Phytopath. Lab. "Willie Commelin Scholten," No. 12 (1928), pp. 28–30*).—The present brief account leaves the question open as to whether *P. corymbiferum* is able to attack healthy tulip bulbs so as to endanger stored stocks, or whether it is able only to follow the attacks of other fungi.

The Dutch elm disease [trans. title], H. W. WOLLENWEBER and C. STAPP (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1928), No. 2, pp. 283–324, pls. 3, figs. 8*).—This account, presented with bibliography, of studies on the Dutch elm disease did not support the view that this disease is caused by *Micrococcus ulmi*. *Graphium ulmi* is discussed in certain connections.

White pine blister rust control in Connecticut, J. E. RILEY, JR. (*Connecticut State Sta. Bul. 314 (1930), pp. 452–477, figs. 9*).—A general discussion of the blister rust situation in Connecticut, in which is presented information on the distribution, the best control practices, and the activities of existing agencies employed in control work. The importance of eradicating all currant and gooseberry plants within 900 ft. of white pine plantations is stressed, and descriptions are given of these undesirable host plants. Certain insect and disease manifestations often mistaken for blister rust on white pine are described.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Porcupine control in the Western States, I. N. GABRIELSON and E. E. HORN (*U. S. Dept. Agr. Leaflet 60 (1930), pp. 8, figs. 6*).—A practical account which includes means of combating the yellow-haired porcupine of the West (*Erethizon epixanthum*), which is a pest in the Western States through its feeding upon vegetation. The injury is caused by its consumption of succulent plants of many species and the buds, leaves, and inner bark and cambium of numerous kinds of trees. Their fall and winter diet consists largely of bark and leaves of coniferous trees, especially the western yellow pine (*Pinus ponderosa*) and several species of juniper. Damage to cultivated crops caused by porcupines occurs chiefly during the spring and summer months and includes the destruction of young fruit trees and the defoliation of more mature ones, eating and wallowing down alfalfa, and feeding upon many truck crops.

By far the most serious damage from an economic standpoint, however, is their injuring or killing of young forest trees. During the later summer, fall, and winter months, porcupines in their efforts to get at the inner layer of bark often partly or completely girdle the main leaders, or boles, of the trees. Many of the small seedlings (up to 5 years of age) are completely consumed, while the larger ones frequently suffer injury serious enough to cause their death, but more often this injury results in a weakened bushy topped or spike-top tree useless for commercial purposes. In areas of heavy infestation, 10 to 100 per cent of the young growth is thus damaged.

Control consists in hunting and shooting and in the use of poison.

Report of the department of biology, T. C. NELSON (*New Jersey Stas. Rpt. 1929, pp. 95–104, figs. 5*).—The work of the year here reported upon deals with weather and water conditions, the fattening of oysters in shoal water, spawning and setting, mortality of oysters from coral sand, and skin irritation due to redbeard sponge. It was found that oysters from shallow water increased in fatness almost 6 per cent more than did controls. Although it is possible that more diatoms and protozoa were growing on the shells of the oysters in shoal water, examination of the water itself showed a marked difference in the number of dinoflagellates present in the two localities.

Reference is made to the mortality in the oyster caused by the marine polychete worm *Sabellaria vulgaris* Ver., which reached as high as 50 per cent in some of the more heavily infested beds.

[Report of work in economic entomology at the Louisiana Stations] (*Louisiana Stas.* [*Bien.*] *Rpt. 1928–29, pp. 37, 38*).—In the fumigation of grain with paradichlorobenzene at the rate of 20 lbs. to 1,000 cu. ft. of space, the corn weevil was found by H. Spencer to be killed as efficiently as by 15 lbs. of carbon disulfide, and the protection lasted longer. It was found, however, that an objectionable flavor was imparted to the grain, and this flavor was pronounced in eggs from hens fed fumigated corn and in milk from cows receiving such corn in their ration.

In cane borer control work by W. E. Hinds and Spencer more than 50 brands, modifications, or mixtures of silicofluoride dusts were tested. Several gave a higher borer mortality than did Jungmann's Extra Light with 10 per cent hydrated lime. In trash disposal tests at Cinclare in 1929 the plats burned over thoroughly showed only 17 per cent of borer larvae alive during the first week of March, while plats with trash partially burned showed 52 per cent and those with trash left on the surface of the ground showed 50 per cent. In August the borer-infested seed plat showed only 86 per cent of the stand of cane that occurred in the borer-free plat. A soldier beetle of the genus Chauliognathus, which searches for borer larvae in the burrows and consumes them, was the most important predator observed. The egg parasite *Trichogramma minutum* checked the activity of the borer and gave a good crop of cane as a result of the rearing and distribution of more than 16,000,000 individuals in 1928 and a larger number in 1929.

In a study by Spencer and C. L. Stracener of soil animals attacking sugarcane roots it was found that springtails of the genera Lepidocyrtus and Onychiurus and a garden centipede of the genus Symphylella "pit" sugarcane roots, eat off the lateral feeding root-branches, and attack the "eyes" of planted cane. In control experiments these pests reduced the top growth by 14 per cent, reduced cane weight 18 per cent, and slightly lowered the percentage of sucrose.

Report of the department of entomology, T. J. Headlee et al. (*New Jersey Stas. Rpt. 1929, pp. 125–187, 193–207, fig. 1*).—A brief reference is first made to the insects of the year, information on 312 species having been furnished in the course of correspondence amounting to 10,000 letters.

Under the heading of Mosquito Investigations and Control accounts are given of egg-laying habits of the fresh water swamp mosquito (*Aedes sylvestris*), mosquito traps, plans and surveys, correlation of antimosquito effort, summary of mosquito control accomplishments by county and municipal agencies, education and publicity, and mosquitoes of the year, all by F. W. Miller; toxicity of oil and its penetration into respiratory siphons of mosquito larvae, and value of crank case waste oil in mosquito control work, both by J. M. Ginsburg; and the influence of summer rainfall upon mosquito prevalence, by Headlee. A direct study of toxicity and penetration of oil has shown that (1) practically all oils when laid upon the surface of water in which mosquito larvae and pupae are living penetrate the respiratory siphons with a speed which varies inversely as the viscosity of the oil; (2) the toxicity of these oils to mosquito larvae and pupae, as measured in terms of speed of kill, varies inversely as the boiling range; (3) oils of high boiling points and low volatility possess little or no toxicity to larvae or pupae; (4) oils of high boiling points, such as lubricating and similar oils, may cause death of larvae and pupae by suffocation; (5) for efficient mosquito control work in the field, the oil must not only form a uniform film but must also be directly toxic to larvae and pupae.

Work with crank case waste oil led to the conclusions that (1) such oil, when properly strained and mixed with a cheap toxic spreader such as cresylic acid, varnolene residue, or kerosene, produces a heavy killing film against mosquito larvae and pupae; (2) this oil mixture, when sprayed on the surface of mosquito breeding water, lasts from two to four weeks, or twice as long as the ordinary fuel oil; and (3) the cost of the crank case waste oil mixture amounts to approximately half of that of fuel oil.

A brief reference to climate and insect investigations is followed by reports on orchard insect investigations, noted under the headings of codling moth, oil emulsion and cresylic acid against the overwintering eggs of the green and rosy apple aphid, leopard moth, and summer infestation of apple by the green apple aphid (pp. 142–150); oriental peach moth, by B. F. Driggers (pp. 150–167), a reference to the parasites of which has been noted (E. S. R., 62, p. 156); twig, leaf, and fruit growth of Baldwin and Grimes Golden apple trees with respect to the time of spraying, by C. C. Hamilton (pp. 167–173); summer oil sprays and their effect on apple trees (pp. 173–176) and effect of pyrethrum vapors on insects (pp. 176–178), both by Ginsburg; results of tests with contact insecticides, by Hamilton (pp. 179, 180); vegetable insect investigations, including the Mexican bean beetle (E. S. R., 61, p. 255) and the pepper maggot, both by R. C. Burdette.

The results obtained from the thorough application with a hand sprayer in late April of pineol soluble, diluted with equal parts of water, seem to indicate clearly that, if properly applied, it destroys approximately 100 per cent of the overwintering codling moth larvae, but that this application should be made before pupation takes place. Furthermore, no injury to the bark of the treated trees, either in the large block or in the retreated block, made its appearance.

A mixture of 4.5 gal. of oil emulsion plus 0.5 per cent cresylic acid applied in the strictly delayed dormant period gave a satisfactory control of the green apple aphid and the rosy apple aphid by practical growers. In an experimental way cresol was used as a substitute for cresylic acid and gave identical results. In no instance was the burning from any of these materials serious. A combination of oil emulsion and free nicotine was much more generally used with about the same results.

In combating the leopard moth in apple trees the combination of any one of several insecticides, including naphthalene, nicotine, and benzyl chloride, with pineol soluble was effective against deep larvae as well as shallow larvae.

In controlling summer infestation of the apple by the green apple aphid it was found that ⅛ pint of 40 per cent free nicotine and 6 lbs. of potassium oleate soap (40 per cent water) to 100 gal. of water gave a very satisfactory kill when thoroughly applied, and that the application should be made and repeated as often as may be necessary to prevent the leaves from being curled.

Further studies with the oriental peach moth (E. S. R., 61, p. 749) were concerned chiefly with the development of an artificial control. In laboratory tests with white oil impregnated with different chemicals and used in a water emulsion, both pyrethrum at the rate of 23.9 gm. in 100 cc. of oil and nicotine oleate 10 gm. in 100 cc. of oil gave about 89 per cent kill of larvae and eggs. In insectary tests of dusts used as mechanical barriers against the young larvae 99.1 per cent kill was obtained from the application of mica of a 200-mesh fineness. In field tests white oil with a pyrethrum content of 24 gm. to 100 cc. of the oil indicated that the oil content of the spray should be increased from 0.5 to 1 per cent actual oil.

The percentage of oriental peach moth infested peaches on vegetative and nonvegetative peach trees at Riverton, the number of oriental peach moths caught in bait pans located in hard and soft trees, the number of injured twigs on vegetative and nonvegetative peach trees, the number and percentage of injured peaches on hard and soft trees August 9 to 13, 1928, and also at time of harvest, the invisible injury on hard and soft trees, the emergence of moths and parasites collected as larvae in the fall and kept over winter in different situations, the percentage of *Macrocentrus ancylivora* and *M. delicatus* found in weekly collections of larvae made in three orchards at the college farm, New Brunswick, and dates of liberation and numbers liberated of *M. ancylivora* and *M. delicatus* in two orchards are reported upon in tabular form.

Data on the twig, leaf, and fruit growth obtained in connection with the work by Hamilton, previously noted (E. S. R., 61, p. 544), are summarized, the details being presented in tabular form. The data show that the increase in twig length, number of leaves, and leaf area occurs very rapidly during the period when the first three sprays are normally applied; that is, from the petal-fall spray to the 17-day spray. Therefore, if a spray coating is to be maintained upon the foliage at this time it will be necessary to spray either quite thoroughly or more frequently. The data also show that the percentage of the total diameter of the apples developed during this period of spraying is small, therefore any lead arsenate deposited during this period would be small in relation to the total volume and weight of the fruit at picking time because of the increase in size of the fruit.

In studying the effect of summer oil sprays on apple trees a highly refined oil of 220 viscosity containing both kerosene and oil extracts of pyrethrum, emulsified by the aid of powdered skim milk, was applied to Wealthy and Gravenstein varieties. The spray tank was thoroughly freed from sulfur and other residue before the applications were made at strengths of 0.5 and 1 per cent. Frequent observations of fruit and foliage failed to disclose any injury, nor was there any drop of foliage or fruit in excess of that noticed on the standard blocks. On the other hand, the leaves of the sprayed trees began after the second oil application to assume an increasingly darker green color than did the leaves on the unsprayed trees. It was found that the oil-sprayed leaves of both varieties contained more chlorophyll than did the corresponding checks, the increases amounting to 28 per cent in the Gravenstein and 47 per cent in the Wealthy. Although no definite explanation is offered, several are suggested.

The study of the injury caused by oil-sulfur sprays was continued. Copper oleate was tested as a possible fungicide to replace the sulfur in oil sprays, no injury resulting in the preliminary work. The oil-sprayed trees were remarkably free from leafhoppers as compared with the checks, corroborating the results obtained the preceding year, and justifying the conclusion that oil-pyrethrum spray controls the pest. On the other hand, the aphids heavily infested the trees and were not controlled by the oil-pyrethrum sprays, necessitating the addition of Blackleaf 50 (1 to 500) in the fourth spray.

In testing the effect of pyrethrum vapors on insects it was found that when caterpillars were transferred to apple trees sprayed one hour previously with an alcoholic suspension of pyrethrum flowers they died within 24 hours, but when transferred to the same trees five days later they suffered no ill effect. It is pointed out that while it is fairly certain that pyrethrum owes its main toxic properties to a mixture of pyrethrum esters, the possibility of the volatile oils of pyrethrum possessing some insecticidal activity is not excluded. A description is given of two different methods of studying the poison properties of pyrethrum that were made use of. A comparison of the results from the checks and the pyrethrum treated cages and respiration chambers shows that the volatile material emanating from pyrethrum when used in the form of flowers and extract does not play any part in its toxic activity on insects.

The results of tests with contact insecticides, including Red Arrow, Blackleaf 40, and Derrisol, are reported upon in detail in tabular form.

In continuing work with the pepper weevil the insecticides and repellents tested failed to give satisfactory control.

The report on cranberry and blueberry investigations by C. S. Beckwith and B. R. Fudge (pp. 187–193), noted elsewhere (p. 340), is followed by an account of soil-infesting insect investigations (pp. 193–197), including tests with naphthalene and pyrethrum. At temperatures of 70° F. or above it appears that soil which is mixed with flake naphthalene at the rate of 3,000 to 1 is deadly to the wireworm. It appears that the blanketing method of application does not give much hope of efficiency. The work with Pyrethrol is encouraging, since this is the first material that has been found to kill wireworms after they have begun their attack upon plants without damage to the plants.

Bee investigations, reported upon by R. Hutson (pp. 198–203) deal with the moving of overwintered bees for orchard use, the details of which are presented in tabular form, package bees, breeding bees for disease resistance, etc.

Aserica castanea Arrow, a recently recorded scarabaeid beetle injurious in New Jersey, is considered by Hamilton (pp. 203–207). This beetle, first reported from New Jersey at Orange in September, 1921, has increased in importance, it now occurring in Westchester and Nassau Counties, N. Y., five counties in New Jersey, and in Montgomery County, Pa. An account is given of its life history, which is quite similar to that of the Japanese beetle. Control work indicates that if the beetles are abundant during the summer they may be destroyed best by thoroughly spraying the lawns with arsenate of lead used at a concentration of at least 4 lbs. to 50 gal. of water. Tests conducted with stomach poisons and with contact poisons show that the larvae may be controlled in the same manner as grubs of the Japanese beetle. Methods of control are dealt with in a circular issued by the State department of agriculture (noted on p. 357).

[Studies of economic insects in British Columbia] (*Ent. Soc. Brit. Columbia Proc., No. 26 (1929), pp. 28–60, figs. 9*) —The contributions relating to economic insects presented include the following: Observations on the Woolly Aphis of the Apple, *Eriosoma lanigerum* (Hausm.), by E. P. Venables (pp. 28–33); Host Adaptation in the European Satin Moth [*Stilpnotia salicis* L.], by R. Glendenning (pp. 34–38); The Cherry Fruit Worm (*Grapholitha packardi* Zell.), by W. Downes (pp. 39–43); Observations on the Ant Cricket, *Myrmecophila oregonensis* Bruner, by G. Beall (pp. 44–46); Injury to Primulas from Vine Weevil [*Brachyrhinus sulcatus* (Fab.)] by W. B. Anderson (pp. 46–48); A Remarkable Simuliid Pupa: Notes on *Simulium virgatum* in British Columbia, by E. Hearle (pp. 48–54); Further Additions to the List of Aphids of British Columbia, by R. Glendenning (pp. 54-57); and Another Household Pest Arrives in Vancouver: The Fire Brat *Thermobia domestica* Packard, by G. J. Spencer (pp. 58–60).

[Reports of the entomological department for the years 1926–27, 1927–28, and 1928–29], F. V. Theobald ([*Southeast. Agr. Col., Wye.*], *Research and Advisory Dept. Ann. Rpts. 1926–27, pp. 5–18; 1927–28, pp. 5–23; 1928–29, pp. 5–19*).—These reports (E. S. R., 58, p. 451) deal with the more important insects for the years covered and means of control. The report for 1926–27 contains a brief account of research on the gall midges (Cecidomyiidae) for the eight months ending May 31, 1927, by H. F. Barnes (p. 10).

Work of the division of economic entomology for the year 1928–29, R. J. Tillyard (*Aust. Council Sci. and Indus. Research Pamphlet 15 (1929), pp. 19*).—This is the administrative report of the work by the Imperial Division of Economic Entomology of the Australian Government.

Work of the division of entomology [of Queensland], E. Jarvis et al. (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt., 28 (1927–28), pp. 13–26*).—This includes the annual report of the entomologist for 1927–28, dealing with research and experimental work conducted at the Meringa Sugar Experiment Station, by Jarvis (pp. 14–19), also work at the Central Sugar Experiment Station, by A. N. Burns (pp. 19–23), and at the Southern Sugar Experiment Station, by R. W. Mungomery (pp. 23–26).

Report of entomologist, L. J. Newman (*West. Aust. Dept. Agr. Ann. Rpt. 1929, pp. 32, 33*).—A brief account of work with some of the more important insects in Western Australia (E. S. R., 60, p. 845).

Entomological report for the Province of Katanga, 1928 [trans. title], C. Seydel (*Bul. Agr. Congo Belge, 20 (1929), No. 2, pp. 228–237*).—Lists are given of pests of the more important crops, including cotton, potatoes, coffee, corn, and citrus. Forty-eight forms of Culicidae are represented.

An annotated list of the important North American forest insects, F. C. Craighead and W. Middleton (*U. S. Dept. Agr., Misc. Pub. 74 (1930), pp. 31*).—This annotated list of the most important forest insects of North America is presented under the headings of tree-killing bark beetles; insects boring in living trees; insects affecting forest products; insects affecting seeds, forest reproduction, and nursery plants; and defoliating insects. A list of 89 references to the literature and an index to the insects listed are included.

A contribution to the study of the desert locust (Schistocerca gregaria Forsk.), F. S. Bodenheimer (*Hadar, 2 (1929), No. 7, pp. 136–139, fig. 1*).—This is said to be a summary of an extensive treatise to be issued.

History and activities of locusts in Kenya and relative costs of destruction, E. Harrison (*Kenya Colony Dept. Agr. Bul 9 (1929), pp. [1]+26*).—An account of the occurrence of and work with *Schistocerca gregaria*, first known to occur in Kenya Colony in 1892 and identified in 1905.

The biology of Thysanoptera, with reference to the cotton plant.—V, The relation between the degree of infestation and the type of soil, E. I. MacGill (*Ann. Appl. Biol., 17 (1930), No. 1, pp. 150–161, figs. 7*).—A fifth contribution (E. S. R., 62, p. 155) on the subject. The experiments conducted show that light soil is more favorable to the multiplication of soil pupating species of thrips than an easily caking clay soil, and that tilling the soil increases the infestation by these insects.

Some effects of temperature and humidity as factors in the biology of the bedbug (Cimex lectularius Linn.), R. M. Jones (*Ann. Ent. Soc. Amer., 23 (1930), No. 1, pp. 105–119, figs. 2*).—This is a report of experiments conducted under constant conditions of both temperature and relative humidity throughout the life of the insect.

Contribution to the biology of Icerya purchasi Mask. (Coccidae, Monophlebinae [trans. title], M. Dingler (*Biol. Zentbl., 50 (1930), No. 1, pp. 32–49, pls. 4, figs. 6*).—Recent observations of the biology of the cottony cushion scale are noted.

Influence of Bordeaux mixture on the efficiency of lubricating-oil emulsions in the control of the San Jose scale, B. A. Porter and R. F. Sazama (*Jour. Agr. Research [U. S.], 40 (1930), No. 8, pp. 755–766, figs. 4*).—Experimental data obtained at the field station at Vincennes, Ind., by the U. S. D. A. Bureau of Entomology in cooperation with the Indiana Experiment Station, are here presented.

Lubricating-oil emulsion was found to be reduced in efficiency in the control of the San Jose scale by the addition of Bordeaux mixture at usual strengths (2–3–50 to 4–6–50). This reduction appears in dormant spraying at low oil concentrations, and practically disappears, under the conditions of these experiments, when the oil content reaches 1.5 per cent. In summer spraying, this reduction is very marked with oil concentrations up to 2 per cent. In practical dormant spraying this renders desirable a moderate increase in the oil content of lubricating-oil emulsion whenever full-strength Bordeaux mixture is used with it. It is pointed out that oil applications in the summer for emergency control should be made separately rather than in combination with one of the regular Bordeaux sprays.

Soft scales injurious to deciduous ornamentals, E. I. McDaniel (*Michigan Sta. Circ. 133 (1930), pp. 17, figs. 11*).—A practical account is given of the soft scales causing injury to deciduous ornamentals and means for their control.

Studies on Panorpa communis L. [trans. title], P. Steiner (*Ztschr. Wiss. Biol., Abt. A, Ztschr. Morph. u Ökol. Tiere, 17 (1930), No. 1–2, pp. 1–67, figs. 41*).—The first part of this contribution deals at length with the biology of *P. communis* (pp. 1–25), and the second part with the morphology and postembryonic development of the skeleton of the head (pp. 26–67) of this scorpion fly.

Notes on the life history and growth of silkworms in Fukien Province, C. R. Kellogg (*Peking Soc. Nat. Hist. Bul., 4 (1929), No. 2, pp. 1–8*).—A brief account of the biology of the silkworm in Fukien Province, where it is possible to rear all three types. This is thought to be the southernmost region of China in which the monovoltine and bivoltine types may be reared commercially, and at the same time the most northern point where the polyvoltine worms may be reared.

Grasserie (or the polyhedral microbe disease) in silkworm broods, in insect pests of forests and agriculture, and in malarial mosquitoes [trans. title], G. Del Guercio (*Redia, 17 (1929), pp. 315, pls. 13, figs. 20*).—This work on polyhedral diseases of insects due to Entomococcus, 70 species in all, includes a chapter on these diseases in mosquitoes, with a review of the measures employed for mosquito control. A list is given of the species and their insect hosts—each being dealt with separately. A 16-page list of publications on grasserie and other diseases is appended.

Some further notes on the elm moth, N. G. Gee (*Peking Soc. Nat. Hist. Bul., 4 (1929), No. 2, pp. 9, 10*).—This is an account of *Euzora* sp., the caterpillars of which defoliated most the elm trees of Peiping (Peking) during the summer of 1928.

Contribution to a knowledge of the spindle worm, Achatodes zeae (Harris) (Lepidoptera, Noctuidae), E. P. Breakey (*Ann. Ent. Soc. Amer., 23 (1930), No. 1, pp. 175–191*).—This is a report of studies of a noctuid, first described by T. W. Harris in 1841, which has been under observation at Madison, Wis., since 1927. Notes are given on its natural enemies, which include *Microplitis gortynae* Riley; *Lissonota* sp., probably *brunnea* (Cress.); *Psychophagus omnivorus* (Walk.); *Amblyteles caeruleus* (Cress.), *A. brevicinctor* (Say), and *Ephialtes aequalis* (Prov.) (Hymenoptera); and birds.

The epidemiology and control of malaria in Palestine, I. J. Kligler *Chicago: Univ. Chicago Press, 1930, pp. XV+240, pls. 2, figs. 71*).—The work includes a chapter on the actual and potential breeding places of anopheline mosquitoes (pp. 19–49) and one on the bionomics of the Anopheles of Palestine (pp. 50–86).

Insects infesting Phormium, D. MILLER (*New Zeal. Jour. Sci. and Technol., 11 (1930), No. 5, pp. 273–283, figs. 5*).—Information on insect enemies of New Zealand flax, based mainly upon the author's published results of an investigation conducted from 1916 to 1919 (E. S. R., 39, p. 159; 40, p. 265; 45, p. 551), is here brought together. The account deals particularly with the looping grub *Orthoclydon praefectata*, the most serious pest of Phormium, and the notching grub *Melanchra steropastis*.

The control of white grubs in lawns and golf courses, B. R. LEACH (*N. J. Dept. Agr. Circ. 163 (1929), pp. 13, figs. 3*).—This is a practical summary of control measures for white grubs, based upon investigations of the Japanese beetle, earlier accounts of which by the author and Fleming have been noted (E. S. R., 55, p. 552; 57, p. 859; 60, p. 562). Lead arsenate, which is best applied in a dry condition mixed with some inert filler, has been found satisfactory in controlling the larvae of the Japanese beetle and other white grubs. Five lbs. to 1,000 sq. ft. is the dosage recommended for use on small lawns or golf greens, while either 150 or 250 lbs. to the acre may be used on large lawns or golf courses. The smaller dosage insures protection for 2 years, but the larger dosage will give protection for 3 or 4 years. It is pointed out that lead arsenate should not be applied to grasses such as *Poa annua* or *P. trivialis*, which are commonly grown in shady locations, or to heavily shaded turf, but that if worms are prevalent in such places they should be destroyed by the application of some other vermicide, such as mercuric chloride solution.

June beetles or white grubs in Michigan, R. H. PETTIT (*Michigan Sta. Circ. 132 (1930), pp. 10, figs. 4*).—A practical summary of information on the larvae of June beetles, which are steadily becoming more plentiful in Michigan. The present publication deals briefly with the life history of white grubs, supplemented by maps which enable ready determination as to just when and where to expect serious injury from them. Three broods are defined and schedules given of their appearance in the State, together with an account of what is known of the present distribution of the various broods in order that the growers in each county of the State may know when to expect an attack.

A further report on the May beetles (Phyllophaga spp.) in Iowa, H. E. JAQUES (*Iowa Acad. Sci. Proc., 34 (1927), pp. 314, 315*).—This report of the occurrence of 22 species of May beetles, of which over 10,000 adults were collected in 21 counties in Iowa during the spring and summer of 1926, supplements the account previously noted (E. S. R., 59, p. 460).

Ecological studies of the Mexican bean beetle, H. L. SWEETMAN and H. T. FERNALD (*Massachusetts Sta. Bul. 261 (1930), pp. 32, pl. 1, figs. 11*).—The authors here report upon a study of the temperature and moisture conditions necessary for the development of the Mexican bean beetle conducted in the laboratory in an attempt to determine whether this insect, which first made its appearance in Connecticut and Massachusetts in 1929, is likely to become a serious pest under the conditions prevailing in New England.

The studies conducted, the details of which are presented in large part in tabular and chart form, led to the following conclusions: A temperature of 37° C. (98.6° F.) kills the beetles in a few hours; 32° is very unfavorable with high humidity and favorable with low humidity; 27° is suitable for heavy oviposition with humidity of 60 per cent or above and unfavorable with low humidity, but favorable for length of life with all humidities used; 22° is favorable with humidities of 40 per cent or above; and 17° with 50 per cent humidity is favorable for length of life but is very unfavorable for egg production.

A temperature of 37° kills the eggs; 32° is very destructive if reached for more than a few hours daily; 27° is suitable with humidities of 60 per cent or above and unfavorable with low humidity; 22° is very favorable with humidities of 60 per cent or above, but less favorable with low humidity; 17° with 50 per cent humidity is very favorable for good hatches, but development is very slow.

A temperature of 37° kills the larvae in a few hours; 32° is very unfavorable, especially with high humidity; 27° is favorable with high humidity and unfavorable with low humidity; 22° is very favorable with all humidities used; 17° with 50 per cent humidity is very favorable for a high percentage maturing, but development is exceedingly slow.

Climatic conditions in the Upper Austral Zone of Massachusetts, Connecticut, and Rhode Island are favorable for the development of the Mexican bean beetle, and the insect may therefore be expected to become a serious pest. Conditions in the Transition Zone are less favorable, but the insect will probably become a pest in the lower portion of the zone, with the injury becoming greatly reduced as the upper limits are approached. The Canadian Zone of New England does not have a physical environment suitable for the development of the beetle.

[Immature stages of Indian beetles], J. C. M. Gardner (*Indian Forest Rec., 11 (1925), No. 4, pp. 189–194, pl. 1; 12 (1925), No. 2, pp. 89–105, pls. 3; 12 (1926), No. 10, pp. 273–282, pl. 1; 13 (1927), No. 2, pp. 31–61, pls. 4, pp. 63–67, pl. 1; 14 (1929), No. 4, pp. 103–132, pls. 6*).—The six papers by the author dealing with this subject are as follows: On Some Indian Brenthidae (Coleoptera).—III, Description of (1) the Larva of *Cerobates tristriatus* Lund., (2) the Larva of *C. sexsulacatus* Motsch, (3) the Pupa of *Cyphagogus corporaali* Kleine; Identification of Immature Stages of Indian Cerambycidae.—I, Cerambycini [E. S. R., 55, p. 764]; On Some Indian Coleoptera.—II, (1) Description of the Early Stages of *Fornax gardneri* Fleut. (Melasidae, Col.), (2) Description of the Larva of *Atractorcerus emarginatus* Cast. (Lymexylonidae, Col.); Identification of Immature Stages of Indian Cerambycidae, II; Descriptions of Three Indian Beetle Larvae (Carabidae, Col.); and Immature Stages of Indian Coleoptera.

A report on the campaign against Stephanoderes, 1929, A. D. le Poer Trench and T. J. Anderson (*Kenya Colony Dept. Agr. Bul. 9 (1930), pp. [2]+19*).—A report of work with the coffee bean borer (*S. hampei*) in Kenya Colony, where it was recognized in April, 1928.

The apple curculio as a pear pest in British Columbia, E. R. Buckell (*Canad. Ent., 62 (1930), No. 3, pp. 47–49*).—During the early summer months of 1927, 1928, and 1929 the apple curculio caused severe injury to small developing fruits of pear trees in the Salmon Arm district of British Columbia. By the end of June as high as 80 per cent of the small pears had fallen from some of the trees, and the majority of those remaining were deformed and unmarketable at harvesting time. It is said to be the first time that the pest has been reported from British Columbia, although it has been taken from hawthorn in several parts of the Province. An examination was made of apple and cherry trees in the pear orchard, but no weevil injury was detected.

The white pine weevil (Pissodes strobi Peck), its biology and control, H. J. MacAloney (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 28 (1930), pp. 87, pls. 13, figs. 9*).—A report of studies of this enemy of white pine, presented under the headings of general position in classification, life history and habits, host trees, indications of injury and character of the damage, summarization of plat data, and control measures. A bibliography of eight pages is included. A report of studies of this pest by Plummer and Pillsbury at the New Hampshire Experiment Station has been noted (E. S. R., 63, p. 56).

Package bees and how to install them, C. B. GOODERHAM (*Canada Dept. Agr. Pamphlet 107, n. ser. (1930), pp. 8, figs. 5*).—This is a practical account.

Studies of foulbrood diseases of bees, A. G. LOCHHEAD (*Canada Expt. Farms, Div. Bact. Rpt. 1927–1928, pp. 17–22, figs. 4*).—This is a further report (E. S. R., 59, p. 358) of cultural studies of *Bacillus larvae*, the cause of American foulbrood, made in an attempt to improve the carrot extract medium for cultivating *B. larvae* (E. S. R., 60, p. 847), which does not grow on the usual laboratory media. In tests made of the growth requirements of the organism, it was found that by the addition of yeast to a medium containing carrot extract, peptone, and dipotassium phosphate better growth of *B. larvae* could be obtained than on any previously tested. It was found that carrot extract, although able to stimulate growth of *B. larvae* when added to the base containing phosphate and peptone, is unable to do so if the latter is omitted. This indicates that some source of nitrogen other than that contained in the extract is required. Nitrate and ammonium nitrogen, however, do not take the place of peptone.

In a study of the European foulbrood it was found that the coccoid bodies developing from *B. alvei* cultures assume a shape and grouping which can not be distinguished microscopically from the coccoid bodies assumed to be *B. pluton* in preparations made from foulbrood material.

The nesting habits of the bald-faced hornet, Vespa maculata, P. RAU (*Ann. Ent. Soc. Amer., 22 (1929), No. 4, pp. 659–675, figs. 10*).—This is a somewhat extended account of observations of a common hornet, *V. maculata*, made in Missouri.

The raspberry crown borer, J. H. CLARK (*New Jersey Stas. Rpt. 1929, p. 228*).—The results obtained in the fall of 1928 confirmed those obtained the preceding year (E. S. R., 61, p. 758), showing that the raspberry root borer can be controlled by pyrethrum soap sprays or by an emulsion made from a highly refined white oil used as ovicides.

Some parasites of the Indian meal moth, W. E. DUNHAM (*Amer. Bee Jour., 69 (1929), No. 8, p. 396, figs. 4*).—These notes relate to the small parasite *Microbracon hebetor* (Say) and the large parasite *Nemeritis canescens* (Grav.) of the Indian meal moth in Ohio. *M. hebetor* is said to have become sufficiently abundant during the last part of the winter months to cause a rapid reduction in the number of Indian meal moths breeding in stored extracting combs.

How many species of Trichogramma occur in North America? A. PETERSON (*Jour. N. Y. Ent. Soc., 38 (1930), No. 1, pp. 1–8, pls. 2*).—Biological evidence is considered by the author to prove that there are at least two distinct species of Trichogramma in North America. While morphologically alike, during the summer the females of one species are distinctly lemon-yellow in color while the females of the other are dark colored (olivaceous-brown), particularly the abdomen and thorax. The two forms will not interbreed, and there is a constant difference in the time required for development and in their habits of flight. The yellow female species appears to be more common in the North than the dark colored (summer form) female species.

A comparative study of a chalcid egg parasite in three species of Plataspidinae, R. E. WALL (*Lingnan Sci. Jour., 6 (1928), No. 3, pp. 231–239*).—This is a report of studies of an unidentified chalcid egg parasite of *Coptosoma cribrarium* Fab., found in the field near Canton, which parasitizes the eggs of two additional pentatomids equally well. Seventy-six per cent of all the egg groups of *C. cribrarium* collected in the field during July and August were found to be parasitized, and approximately 51 per cent of the total number of eggs were parasitized.

Some parasitic Hymenoptera of economic importance in New Zealand, E. S. Gourlay (*New Zealand Jour. Sci. and Technol., 11 (1930), No. 5, pp. 339–343, figs. 2*).—A brief account of some of the more important hymenopterous parasites occurring in New Zealand, including several introduced forms recorded for the first time.

ANIMAL PRODUCTION

The American Society of Animal Production: Record of proceedings of annual meeting, Nov. 29—Dec. 1, 1929 (*Amer. Soc. Anim. Prod. Proc. 1929, pp. 227, pl. 1, figs. 10*).—This is the report of the annual meeting held at Chicago November 29 to December 1, 1929 (E. S. R., 61, p. 257; 62, p. 499).

In addition to the papers previously listed, the following were presented: Our 1930 Program, by H. J. Gramlich (pp. 9–13); The Effect of Plant Maturity on the Biological Value of Alfalfa Proteins, by J. Sotola (pp. 24–29); The Effect of Feeding Sodium Fluoride and Rock Phosphate on Bone Development in Swine, by R. M. Bethke, C. H. Kick, B. H. Edgington, and O. H. Wilder (pp. 29–33); Nutritional Requirements of the Chick, by A. G. Hogan and C. L. Shrewsbury (pp. 34, 35); Medicated Salt as a Fly Repellent, by C. W. McCampbell (pp. 35–37); Chopping Hay for Livestock, by I. W. Rupel, B. H. Roche, J. G. Fuller, and G. Bohstedt (pp. 43–46); On Criteria for Breeding Capacity in Dairy Cattle, by J. W. Gowen (pp. 47–49); Relation of Parity to Size of Litter, Weights, Gains, Mortality, and Sex Ratio in Guinea Pigs, by G. Haines (pp. 49–52); The Inheritance of Cryptorchidism, by J. L. Lush and J. M. Jones (pp. 57–61); Financial Returns from Improving Pastures in the Southeast, by F. R. Edwards (pp. 70, 71); Producing Fat Yearlings for Spring and Late Summer Market, by H. C. Moffett and E. A. Trowbridge (pp. 71–74); Ground Barley vs. Shelled Corn for Fattening Baby Beef Calves, by G. A. Branaman and G. A. Brown (pp. 75–77); The Value of Oat Feed for Growing Fattening Cattle, by A. W. Lathrop and G. Bohstedt (pp. 77–80); The Dairy Breed Steer in the Feed Lot, by J. G. Fuller (pp. 80–82); What the Horse Business Needs Most To-day, by E. McFarland (pp. 82–86); Problems in Horse Husbandry, by J. O. Williams (pp. 86, 87); [Letter on the Remount Service, War Department], by E. G. Cullum (pp. 87–89); Building and Maintaining Animal Motive Power Units at Low Cost, by W. Dinsmore (pp. 89–93); Feeding Potassium Iodide to Mares, by A. L. Harvey (pp. 93, 94); Report of Work to Determine the Etiology of Bursattee in Horses, by C. E. Howell (pp. 95–98); A Gold Medal Colt Club, by P. T. Brown (pp. 99–101); Draft Horse Extension Work in Illinois, by E. T. Robbins (pp. 101–104); Corn Gluten Meal as a Protein Supplement for Fattening Lambs, by A. D. Weber (pp. 104, 105); A Study of Breeding Ewe Lambs, by D. J. Griswold (pp. 106–108); A Study in the Control of Stomach Worms, by H. E. Reed (pp. 109–111); Wool Measurement Technic, by R. H. Burns (pp. 111–121); Tankages for Hogs on Legume Pasture, by C. M. Vestal (pp. 121–124); Protein Supplements for Growing and Fattening Pigs, by J. M. Fargo and G. Bohstedt (pp. 125–128); The Influence of Birth Weight upon Subsequent Development of Inbred and Outbred Pigs, by W. A. Craft (pp. 128–130); Legume Hays for Brood Sows during Gestation and Lactation, by E. Martin (pp. 130–133); The Influence of Vitamins B and E on Reproduction in Swine, by C. E. Aubel, J. S. Hughes, and H. F. Lienhardt (pp. 133–135); Factors Affecting the Cost of Pigs to Weaning Age, by E. H. Hostetler (pp. 135, 136); Factors That

Influence the Significance of Hog Carcass Data, by E. L. Scott (pp. 136–142); Factors Influencing Deposition of Fat on the Hog, by F. H. Helmreich (pp. 143–145); The Seedy Cut Problem in Swine, by L. J. Cole, J. S. Park, and A. Deakin (pp. 145–147); A Study of the Cut-out Values of Hogs, by M. D. Helser (pp. 148–151); Extension Teaching Methods, by R. Beresford (pp. 165–168); What Can the Extension Man Do to Assist Research? by P. Gerlaugh (pp. 168–171); Range Livestock Projects, by L. H. Rochford (pp. 172–174); Better Sire Work in Kentucky, by W. Rhoads (pp. 174–177); The Kansas Five-Year Beef Cattle Program, by J. J. Moxley (pp. 178–180); Organization for Sheep Improvement Work in Kentucky, by R. C. Miller (pp. 180–184); Swine Feeding Demonstrations in South Carolina, by J. R. Hawkins (pp. 184–187); Meat Research in the Program of the National Livestock and Meat Board, by R. C. Pollock (pp. 188–191); and Cooking Work in the Quality of Meats Project, by L. M. Alexander (pp. 192, 193).

Intensive grassland management, R. C. FOLEY, E. J. MONTAGUE, and C. H. PARSONS (*Massachusetts Sta. Bul. 262 (1930), pp. 33–50, figs. 9*).—The results of a 2-year study to determine the value of the Hohenheim system of pasture management under Massachusetts conditions is reported in this bulletin. The system is based on four principles, (1) division of area into plats, (2) use of concentrated fertilizers, (3) rotational grazing, and (4) combination of grazing and hay land. Nine fields of 8.25 acres each were used in this study, one plat serving as a check. In 1928 all plats received a complete fertilizer early in the spring, and three applications of nitrogen were made later in the season. In 1929 one plat received only phosphoric acid and potash, the remaining plats being treated in practically the same manner as in the previous season. The grazing of the plats was rotated, allowing the heavy-milking cows to graze until the choicest portion was used, following with the lower-producing cows, and finally with the dry cows and young stock. After the entire plat had been grazed sufficiently close it was given a rest period of about 2 weeks. Three plats were allowed to mature a hay crop and, after cutting, were used later in the season in the rotation. The first season of this study was extremely wet and the second very dry.

The 2 years' results, while not conclusive, show that this system is practicable even under extreme conditions of rainfall, and that the carrying capacity of the pasture was greatly increased. The use of fertilizers improved the quantity and quality of the grasses, and the nitrogen fertilizer had an immediate and pronounced effect. The cumulative effect of fertilizer is an outstanding factor. This system of pasture management lengthened the grazing season and increased the carrying capacity, thus reducing the amount of barn feeding.

Steer feeding experiments in the Black Belt of Alabama, J. C. GRIMES (*Alabama Sta. Bul. 231 (1930), pp. 18*).—A series of experiments begun in 1925 and completed in 1929 to obtain information of value to cattle producers in the Black Belt of Alabama is reported on in this bulletin. The results are divided into three sections, parts of which have been previously noted (E. S. R., 60, p. 169).

I. *Fattening steers.*—Over a 3-year period steers fed cottonseed meal and Johnson grass hay made an average daily gain of 1.33 lbs. per head at a feed cost of $12.13 per 100 lbs. of gain, and returned a profit above feed cost of $1.64 per head. During the same period steers which had blackstrap molasses in addition to the above ration gained at the rate of 1.61 lbs. per head daily at a feed cost of $13.16 per lbs. of gain, and returned a profit over feed cost of $2.03 per head. The steers receiving molasses had slightly more finish at the end of the feeding period and sold for 39 cts. per hundredweight more than those receiving no molasses.

II. *Wintering steers in the Black Belt.*—During a 112-day wintering period steers fed low-grade Johnson grass hay lost an average of 46.4 lbs. per head, while those receiving hay plus an average of 1.89 lbs. of cottonseed meal daily gained 27.6 lbs. per head. The average wintering cost was $7.49 per steer on hay alone and $11.48 on hay and meal. However, at the end of the wintering period it was found that steers fed hay alone would have to sell for 67 cts. more per hundredweight than steers fed hay and meal in order to break even.

III. *Feeding cottonseed meal to steers on grass.*—For steers running on good pasture the addition of approximately 4.5 lbs. of cottonseed meal daily proved profitable. Steers finished on grass alone and sold in June made an average daily gain of 1.92 lbs. per head over a 77-day period. The average cost per 100 lbs. of gain was 95 cts., and the profit per steer $8.11. The steers receiving cottonseed meal gained at the rate of 2.52 lbs. per head daily at a feed cost of $4.21 per 100 lbs. of gain, and returned a profit of $9.74 per head.

The results of the 3 years' study indicate that it is more profitable to winter steers on cheap feed and finish them on grass for summer market than to fatten them in the winter for market in March or April.

Beef cattle investigations, 1929–30 (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1929–30, pp. 2–7*).—The results of two experiments are reported in continuation of those previously noted (E. S. R., 62, p. 362).

The comparative value of kafir fodder fed in different forms.—In this study 4 lots of 10 yearling animals each, consisting of 8 steers and 2 heifers, averaging approximately 710 lbs. per head were fed for 150 days. All lots received cottonseed cake at the rate of 1 lb. per head daily. In addition lot 1 received whole kafir fodder, lot 2 chopped kafir fodder, lot 3 ground kafir fodder, and lot 4 kafir fodder silage. The average daily gains were 1.6, 1.41, 1.9, and 1.96 lbs. per head in the respective lots.

The average gains produced by kafir fodder fed from 1 acre when supplemented with cottonseed cake were 216.73, 218.55, 293.94, and 557.31 lbs. in the respective lots. Based on the gain per acre and allowing whole kafir fodder the value of 100 per cent, chopped kafir fodder was worth 100.83 per cent, ground kafir fodder 135.62 per cent, and kafir fodder silage 257.14 per cent.

The value of supplemental feeds in winter rations for stock cattle (calves).—To determine the value of supplemental feeds and to compare kafir hay and Atlas sorgo silage as roughages for stock cattle, 6 lots of 5 steer and 5 heifer calves each averaging approximately 465 lbs. per head were fed for 150 days. The following rations were fed: Lot 1, kafir hay; lot 2, kafir hay plus 2 lbs. of ground kafir grain per head daily; lot 3, kafir hay plus 1 lb. of cottonseed cake per head daily; lot 4, Atlas silage plus 2 lbs. of ground kafir grain per head per day; lot 5, Atlas silage plus 1 lb. of cottonseed cake per head per day; and lot 6, Atlas silage plus 4 lbs. of alfalfa hay per day. The average daily gains in the respective lots were 0.12, 0.62, 0.93, 0.65, 1.03, and 0.87 lb. per head. The average gains per acre with the supplements fed were 63.84, 357.96, 586.48, 363.83, 576.26, and 572.47 lbs. in the respective lots.

The addition of 2 lbs. of ground kafir per head daily to the ration of kafir hay increased the gain 76.3 lbs. per head, while adding 1 lb. of cottonseed cake increased the gain 121.6 lbs. per head. On this basis 1 lb. of cottonseed cake was worth 2.96 times as much as 1 lb. of ground kafir as a supplement to kafir hay. The addition of 1 lb. of cottonseed cake to a ration of Atlas silage produced 56.94 lbs. more of gain per head than did the addition of 2 lbs. of ground kafir grain. On this basis 1 lb. of cottonseed cake was worth 3.16 lbs. of ground kafir as a supplement to Atlas silage. On the basis of gain per acre of feed fed, 1 lb. of cottonseed cake was worth 4 lbs. of alfalfa hay, and on the same basis kafir hay and Atlas silage had approximately the same feed value.

[Experiments with beef cattle at the Louisiana Stations] (*Louisiana Stas. [Bien.] Rpt. 1928–29, pp. 27–29*).—The results of experiments by C. I. Bray are noted.

Fattening cattle with grain on pasture.—In 1928, 2 lots of steers averaging 408.5 lbs. per head were on test for 240 days. Lot 1 on pasture and fed grain in addition made an average daily gain of 1.57 lbs. per head, while lot 2 on pasture alone gained at the rate of 0.91 lb. per head daily. Lot 1 sold for $1.93 more per hundredweight than did lot 2, and returned a profit of $8.09 as compared with $7.25 for lot 2.

In 1929, 2 lots of ten 2-year-old steers each and 1 lot of yearlings were fed for 112 days. Lot 1, 2-year-olds, and lot 3, yearlings, received grain (5 lbs. of brewers' rice and 1.5 lbs. of cottonseed meal) in addition to pasture, while lot 2 was on pasture alone. The average daily gains in the respective lots were 2.2, 1.64, and 2.2 lbs. per head. Lot 3 sold for $1.06 more per hundredweight than lot 1, and the latter lot sold for $2.05 more than lot 2. The profit per head was $6.54, 0.97 cts., and $12.59 in the respective lots.

Brahman cattle in Louisiana.—Native and grade Louisiana cows were divided into 2 equal lots of 25 cows each. One lot was bred to a Brahman and the other to a Hereford bull. On July 15 the Brahman calves averaged 285 lbs. per head and were valued at 11 cts. per pound, while the Hereford calves averaged 232 lbs. per head and were valued at 11.5 cts. per pound. Brahman heifers were only 30 lbs. heavier in December than Hereford heifers. The results indicate that the Brahman cross is satisfactory for producing market calves.

Velvetbeans for wintering calves.—On 24 acres of cornstalks and velvetbeans, 31 calves made an average daily gain of 1.06 lbs. per head during an 87-day period from November to February. Estimating the value of the beans at 12 cts. per pound for each pound of beef produced, an acre of beans was worth $13.92 in addition to 15 bu. of corn per acre.

Steer feeding on pasture vs. feeding in dry lot, H. P. GERLAUGH (*Ohio Sta. Bimo. Bul. 144 (1930), pp. 87, 88*).—Steers averaging approximately 659 lbs. per head were divided into 3 lots of 11, 12, and 12 head, respectively, and fed for 168 days as follows: Lot 1 in the barn, lot 2 in an open shed with an outside dry lot, and lot 3 on bluegrass pasture (E. S. R., 61, p. 457). All lots received an average daily ration of 15 lbs. of shelled corn and 1.1 lbs. of linseed meal. In addition, lots 1 and 2 received 1.3 lbs. of mixed hay and 15 and 17 lbs. of corn silage, respectively.

The average daily gains were 1.92, 1.83, and 2.13 lbs. per head in the respective lots. The steers fed on pasture made more economical gains than those fed in the barn, and the barn-fed cattle were more economical than those fed in the open shed. It was observed that the cattle in the shed suffered more from the heat and flies than either of the other lots. The appraised value of the cattle ranked them in the order of lots 1, 3, and 2, but the pasture-fed steers outdressed the dry-lot cattle. Pigs following the steers in lots 1 and 2 salvaged sufficient corn to make approximately 1.5 lbs. of gain per bushel of corn fed to the steers. The results indicate that the advantages of feeding steers on pasture are due to the grass consumed and not to the sunshine and outdoor air.

A study of certain factors affecting the production and quality of veal (*New Jersey Stas. Rpt. 1929, pp. 20, 21*).—A survey was made of 42 markets located in 7 different cities in the State. These markets were selected on the basis of the character of the population served. In the markets handling select and medium quality veal there was competition between western and native calves due to the greater uniformity, availability, and Government inspection of the former. Practically all the veal in the kosher stores and in the stores handling the poorer quality was from native calves. The survey indicates that a greater demand for native veal would exist if a more marketable product was offered, if more careful grading and inspection were followed, and if practical State laws were enacted that would protect the consumer and at the same time legalize the sale in New Jersey markets of native veal that is wholesome.

[Experiments with swine at the Louisiana Stations] (*Louisiana Stas. [Bien.] Rpt. 1928–29, pp. 25–27*).—The results of three experiments by J. R. Francioni are briefly noted.

Sweetpotatoes for swine.—A preliminary study in 1927 with cull sweetpotatoes showed that they had a feeding value of 30.7 cts. per 100 lbs. when supplemented with tankage and 14 cts. per 100 lbs. when fed alone.

Pigs fed sweetpotatoes in the field in 1928 required 35.7 lbs. per pound of gain when fed sweetpotatoes alone, but when allowed access to tankage in a self-feeder they made a pound of gain on 21.3 lbs. of sweetpotatoes and 0.46 lb. of tankage.

In 1929 a lot of pigs fed sweetpotatoes in the field supplemented with tankage required 16.7 lbs. of sweetpotatoes with the vines per pound of gain, while those receiving soybeans as a supplement required 20.4 lbs. of sweetpotatoes with the vines.

Vitamin studies with swine.—Pigs receiving a small amount of cod-liver oil (5 per cent of the supplemental mixture) gained 1.56 lbs. per head daily at a cost of 8.5 cts. per pound of gain, while those receiving no oil gained 1.38 lbs. per head daily at a cost of 8.7 cts. per pound of gain.

Protein supplements for swine.—The following protein supplements were fed with a basal ration of corn and rice polish (3:1): Digester tankage; shrimp meal; tankage, soybeans, alfalfa, and cottonseed meal 3:1:1:1; shrimp bran, soybeans, alfalfa, and cottonseed meal 3:1:1:1; and cracklings tankage. The average daily gains were 1.8, 1.75, 1.67, 1.88, and 1.88 lbs. per head on the respective rations.

Molasses for work mules (*Louisiana Stas. [Bien.] Rpt. 1928–29, p. 30*).—M. G. Snell and W. G. Taggart found that a ration of molasses and soybean hay for mules cost 19 cts. per day as compared with 41 cts. for a ration of corn and soybean hay. The mules receiving molasses did not eat as much feed nor hold up as well in hot weather as those receiving corn, indicating that molasses as the sole concentrate is unsatisfactory for work mules.

[Experiments with poultry at the Louisiana Stations] (*Louisiana Stas. [Bien.] Rpt. 1928–29, pp. 47–49*).—The results of several experiments by W. M. Ginn and C. W. Upp are noted.

Rice by-products in the laying ration.—Laying hens receiving rations containing from 10 to 30 per cent of rice products produced as well as and in some cases better than hens receiving rations containing no rice products.

Rice by-products for chicks.—Up to 6 weeks of age (at which time the test was terminated due to coccidiosis), chicks on rations containing rice bran, rice polish, and brewers' rice in various combinations grew as rapidly as those on a standard chick ration. There was one exception, and in that case practically 50 per cent of the ration was composed of rice products. The results indicate that rice products, when not too heavily fed, may be successfully used as a part of the chick ration.

The effects of high and low egg production on hatchability of the eggs.—The first year's results of this study indicated that the number of eggs laid before the breeding season did not materially affect the fertility or the hatchability of the eggs, the percentage of chicks that lived, or the rapidity of their growth.

Storage of Louisiana eggs.—A 3-year study has shown that Louisiana eggs can be successfully stored if the birds producing the eggs are correctly managed and if the eggs are properly cared for and stored while fresh.

[Poultry experiments at the New Jersey Stations], W. C. Thompson (*New Jersey Stas. Rpt. 1929, pp. 278–281, fig. 1*).—The general conclusion reached in a study of close confinement of growing stock is that the method can be made satisfactory, but involves a considerable increase in initial cost of housing equipment and necessitates more extensive care. In cases where soil is known to be infested with parasites this method is advocated as a safe measure, but otherwise it is not necessary. For pullets in their first laying year this method tends to control the environmental factor, works toward the elimination of infectious diseases, and keeps the birds closer to their feed, thereby increasing food consumption which tends to increase egg production.

The all-mash method of feeding young chicks and chicks in battery brooders has been found to be economical, efficient, and to save labor. For laying and breeding stock the all-mash method of feeding has given fair results, but it is believed that a supplement of a moist mash daily together with some grain feeding would improve the ration for adult fowls.

Rations containing 0, 5, 10, and 14 per cent of meat scrap and analyzing 10, 12, 14, and 16 per cent of protein, respectively, have been fed to laying birds for about 2 years. The results indicate that the 14 per cent protein level is the most efficient, and that a fairly high level is necessary to maintain body weight and to stimulate egg production.

In a study of the value of green feed in the poultry ration it appeared that up to 8 weeks of age chicks do not need such material, but after that age the growing pullets do better when green feed is included in the ration, and this was especially true of late-hatched chicks. Green feed apparently produced pullets more deeply pigmented and in better physical condition than birds receiving no green feed. As a supplement to the laying ration green feed has no apparent effect during the winter and spring, but is beneficial during the summer and fall. The hatchability of eggs was not apparently affected by the inclusion or omission of green feed. Alfalfa leaf meal proved to have no particular advantage in the ration of laying pullets or of breeding stock.

[Studies in animal nutrition at the New Jersey Stations] (*New Jersey Stas. Rpt. 1929, pp. 8, 9*).—No significant differences were found in a quantitative analysis of the nonprotein nitrogen, uric acid, urea, creatine, and blood sugar of the blood of two groups of hens fed rations differing in protein content over a period of 10 weeks.

Continuing the comparison of the vitamin A content of alfalfa leaves dried by artificial heat and of those cured in the field (E. S. R., 59, p. 390), it was found that the vitamin content was much superior in the artificially cured materials. The data suggest that the loss of green matter in field curing is accompanied by a loss in vitamin A potency.

Yellow dent corn was found to be a more potent source of vitamin A than a white-capped yellow dent variety.

A ration deficient in vitamin D again caused low egg production and practically stopped hatchability (E. S. R., 61, p. 763). Injecting vitamin D into the yolk or exposing eggs to ultra-violet light failed to increase the hatchability of eggs from hens on the deficient diet.

In a study of the effect of calcium citrate and carbonate upon the rate of disappearance of a protein from the stomach of the white rat and the pH of the contents, it was found that the addition of either calcium compound to the protein retarded the passage of food from the stomach. The pH of the stomach content was changed by the addition of either compound, but the calcium carbonate produced the more marked change.

Continuing the study of the influence of sunlight transmitted through Cel-O-Glass (E. S. R., 61, p. 763) and of vitamin D supplements on egg production, quality of eggs, vitamin D content of yolks, and general health and mortality, it was found that the lowest egg production and the poorest quality eggs were produced in a group of pullets maintained under window glass and receiving no ultra-violet rays shorter than 3,200 a. u. and without vitamin D supplement. The bone ash of chicks exposed to sunlight transmitted through ordinary window glass was no greater than that of chicks on the same ration but kept in the absence of daylight, and severe leg weakness developed in both groups.

Summer management of pullets, D. C. Kennard and R. M. Bethke (*Ohio Sta. Bimo. Bul. 144 (1930), pp. 79–86, figs. 4*).—The advantages and disadvantages of the free range on bluegrass, clover, or alfalfa, and of confinement to brooder or laying house with or without a wire screen sun parlor for the summer development of pullets are discussed.

Successful poultry farming, T. W. Toovey (*London: Crosby Lockwood & Son, 1930, 5. ed., rewritten, pp. VIII+113, pls. 11, fig. 1*).—This is a revision of the treatise previously noted (E. S. R., 52, p. 876).

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the New Jersey Stations], J. W. Bartlett (*New Jersey Stas. Rpt. 1929, pp. 25, 26, 108, 109, 112–121*).—The results of experiments, most of which are continuations of work previously noted (E. S. R., 61, p. 764), are reported.

The relation of feeding fish meal to odors and flavors in milk.—No off flavor or odor could be detected in either the cold or heated milk of 2 cows fed from 3 to 30 per cent of white fish meal, dehydrated by a vacuum process.

Comparison of German peat moss to shavings as a bedding in stables.—As a bedding for box stalls German peat moss had about four times the absorbing qualities of shavings. For cows, however, shavings were superior to moss since the animals became stained after the second day's use of moss. For young calves the moss may remain in pens for 7 days without becoming too moist, and the shavings appear to absorb the odors of the pen. One bale of peat moss was equal to four bales of shavings.

Sanitation in calf raising.—In an effort to prevent the spread of colds and distemper among young calves, the newborn animal was left with the dam and allowed to nurse regularly from 3 to 5 days. At this time they were removed and isolated either in sheds at some distance from the herd or placed in wooden boxes large enough to allow the calf some exercise. After 2 months the calves were allowed to run together, and the boxes in which they had been confined were burned. By this method of sanitation 90 per cent of the calves born were raised to 6 months of age, and only 2 cases of distemper occurred among 30 calves raised for 2 months in boxes.

Effect of nitrogen fertilization on the carrying capacity of pastures, C. B. Bender.—Continuing these studies no potash, phosphate, or lime was applied to the plats during the year, but the same nitrogen treatments were followed. On May 8, 45 heifers and dry cows were turned on plat 1, and on May 12, 54 cows were put on plat 4 and continued on this and other plats during the day until June 26. The carrying capacity of the pastures for this season was found to be 1.87, 1.4, 1.02, 1.52, 2.06, 1, and 0.94 cows per acre, respectively. Analyses of the pasture grass on different dates are given.

Effect of nitrogen fertilization on the protein content of corn and the feeding value of the whole plant when ensiled, C. B. Bender.—The same plats and treatments as previously reported were followed in this study. The green and dry weights and analyses of corn samples from the different plats are given in tabular form.

A study of the nitrogen, phosphorus, and calcium balance of dairy calves fed on a dry grain ration containing soluble blood flour, C. B. Bender, J. W. Bartlett, and T. R. Moyer.—In balance studies of the retention of nitrogen, phosphorus, and calcium by calves fed rations containing soluble blood flour as compared with the retention of the same materials by calves fed a basal ration containing no blood flour, it was found that the nitrogen in the soluble blood flour was very efficiently used. The assimilation of phosphorus was slightly in favor of the soluble blood mixtures, but there was no appreciable difference in the assimilation of calcium. Over half of the phosphorus excreted by the young calf was found in the urine, while with milch cows only a small amount of the total phosphorus was excreted in this manner. A "new process" soluble blood flour gave indications of being a somewhat better product than the old process blood flour.

Rations for dairy heifers during winter months, C. B. Bender.—A group of 6 6-months-old Holstein heifers consumed an average of 8 lbs. of alfalfa hay per head daily from September 15 to February 1 and 6 lbs. of oat hay from that date to April 15. During the entire period they received 25 lbs. of corn silage per head daily. At the beginning of the test they averaged 104 per cent normal in weight and 103.3 per cent normal in height and at the close of the study 93.7 per cent normal in weight and 100.2 per cent normal in height.

The effect of feeding cod-liver oil on milk production and body weights of dairy cows, C. B. Bender.—In this study 22 head of cows were fed cod-liver oil for 1 month, and then for 5 months half of them received 60 cc. of cod-liver oil daily and the other half no oil. The animals receiving oil lost 74 lbs. in weight and dropped 289 lbs. in milk production, as compared with 204 lbs. body weight loss and 418 lbs. drop in milk production for the group receiving no oil.

Minimum milk requirements for raising dairy calves, C. B. Bender and J. W. Bartlett.—A group of 4 calves fed milk to 30 days of age and then a dry ration plus alfalfa hay averaged 82.5 per cent normal in weight and 101 per cent normal in height at 30 days and 99 per cent normal in weight and 100 per cent normal in height at 180 days. They consumed an average of 713 lbs. of calf meal to 6 months of age.

The relation of the feeding of mineral oil to growth in young stock and milk and fat production in dairy cows.—A group of 6 Holstein yearling heifers fed 1 qt. of mineral oil daily as a supplement to a ration of hay, silage, and grain gained at the rate of 1.47 lbs. per head daily, while a similar group receiving no oil made average daily gains of 1.35 lbs. per head. When mineral oil was fed by the reversal method to 2 groups of 2 cows each, a slight gain in milk production was noted for 3 of the cows, but no change in fat percentage occurred. The animals fed oil were much improved in condition and had glossy hair coats as compared with those receiving no oil.

Feeding dairy cattle, A. C. Ragsdale (*Missouri Sta. Bul. 281 (1930), pp. 40, figs. 4*).—This is a popular publication presenting useful information as an aid in selecting, purchasing, and preparing rations for economical milk production. Rations that have already been successful under a wide variety of conditions and general feeding rules are suggested, together with a method for calculating rations. A table giving the composition of commonly used dairy feeds is also included.

Dicalcium phosphate as a mineral supplement for dairy cows.—I, Effect on health, C. C. Hayden, C. F. Monroe, and C. H. Crawford (*Ohio Sta. Bimo. Bul. 144 (1930), pp. 89–91*).—In this study (E. S. R., 59, p. 267) no marked beneficial or detrimental results were observed on the health of cows fed dicalcium phosphate. The study covered a period of 5 years and 11 months, and 29 cows were used.

Certified milk conferences held in 1929: Annual conference American Association of Medical Milk Commissions, Inc., and Certified Milk Producers' Association of America, Inc. . . . (*Amer. Assoc. Med. Milk Comns. [etc.] Proc., 23 (1929), pp. [VI]+350, pls. 12, figs. 10*).—This is a compilation of the proceedings of the twenty-third annual conference of the American Association of Medical Milk Commissions, held at Montreal, Canada, June 24 and 25, 1929, also the proceedings of the annual conference of the Metropolitan Certified Milk Producers, held in New York February 4, 1929 (E. S. R., 61, p. 563). Both meetings were held in conjunction with the meetings of the Certified Milk Producers' Association of America.

A study of the action of the ingredients of dehydrated egg yolk on the manufacture of ice cream, F. C. Button (*New Jersey Stas. Rpt. 1929, pp. 26, 121, 122*).—Continuing this study (E. S. R., 61, p. 767), the components of dehydrated egg yolk were carefully isolated into protein, egg oil, lecithin, and cholesterol. Weighed portions of these components in proportion to their percentages in the yolk were added to portions of a basic ice cream mix, and the portions were processed and frozen in the same manner.

It was found that the greater ease of obtaining overrun in mixes made with egg yolk was due to the combined action of the egg oil, lecithin, and protein. The egg protein was responsible for the increased whipping ability and the greater stability in the freezer of mixes containing yolk. The presence of egg oil and lecithin caused the slow initial rise in overrun peculiar to egg yolk mixes. Only egg protein had any influence on the texture of the ice cream. The combined action of the components produced the characteristic flavor and palatability of ice cream made with dehydrated egg yolk.

Dry milk, C. Porcher (*Milwaukee, Wis.: Olsen Pub. Co., 1929, 2. ed. [rev.], pp. X+309, figs. 10*).—This is a translation of the second and revised edition of the treatise previously noted (E. S. R., 29, p. 777).

VETERINARY MEDICINE

[Report of work in animal pathology and parasitology at the Louisiana Stations] (*Louisiana Stas. [Bien.] Rpt. 1928–29, pp. 31, 50, 51*).—A brief mention is made of work with anaplasmosis conducted by H. Morris, several cases of which developed in the beef cattle herd in October, 1927, with a mortality of 50 per cent. The four animals that survived the attack were isolated from the rest of the herd. The one retained for experimental purposes had continued to be a carrier at the time of writing. A limited number of fly transmission experiments seem to indicate that the infection may be transmitted from a diseased animal to a susceptible animal through the interrupted feeding of *Tabanus atratus*, officially known as the large black horsefly. The isolation of carriers following the appearance of the disease at the university farm has prevented any reoccurrence in the herd since the original outbreak.

A study by Morris of the blindness of chickens that is prevalent throughout Louisiana, as high as 10 per cent of some flocks having suffered, seems to indicate that the affection is not associated with paralysis. A blind chicken may become paralyzed through malnutrition, and if given proper care and attention may live to old age. Negative results were obtained in an attempt to transmit the disease through contact. Post-mortem examination of blind chickens showed 70 per cent of the cases to be infected with coccidiosis, 50 per cent with roundworms, 55 per cent with tapeworms, and 20 per cent with *Capillaria* sp.

In work with coccidiosis of fowls by R. L. Mayhew, the time required for oöcysts to reach the infective stage following inoculation was found to vary from 19 to 28 hours. An accurate study of 12 cultures showed that if sporulation occurs, it does so within 24 hours. Positive results were obtained in a test of the infective properties of cultures 19, 20.5, and 24.5 hours old. One chicken in each experiment in which the cultures 19 and 20.5 hours old were used developed hemorrhage on the fifth or sixth day. In studying the length of time chickens remain infected, it was found that in 37 chickens surviving a number of inoculations, 1 was infected 62 days after hemorrhage had occurred, while 3 were negative after 24 days, 2 of the 3 having had hemorrhage. That reinfection had not occurred was indicated by the fact that 17 that were negative on April 24 were still negative on June 21, and of the 20 that were positive on April 24, 19 had become negative on June 30. The work has shown that there is usually a failure to gain weight after chickens become infected. The average weights of heavily infected males were nearly 15 per cent less than that of the lightly infected, while the average weights of the heavily infected females were a little over 12 per cent less than the lightly infected at 16 weeks of age.

Live stock diseases report, No. 5, M. HENRY (*N. S. Wales Dept. Agr., Live Stock Diseases Rpt., 5 (1928–29), pp. 20, fig. 1*).—This is a general report of the work of the year, particularly as relates to infectious diseases and parasites (E. S. R., 61, p. 870).

Metaphen as a germicide and skin disinfectant, G. W. RAIZISS, M. SEVERAC, and J. C. MOETSCH (*Jour. Amer. Med. Assoc., 94 (1930), No. 16, pp. 1199–1201*).—In the course of studies of many compounds involving the nitrobenzene-mercury complex, a substance was finally synthesized by the two senior authors, as reported in 1923 (E. S. R., 50, p. 284), to which the name metaphen was given. The present account deals with studies made of the effect of various antiseptics tested in comparison with it. Metaphen proved to be the only antiseptic in which complete sterilization in all cases was obtained. Experiments conducted with 2 per cent mercurochrome produced sterilization in 79 per cent of the cases and 7 per cent iodine in 88 per cent of the cases, whereas metaphen up to 1:2500 produced 100 per cent sterilization in all of the 50 tests made.

The relations of human and veterinary parasitology, M. C. HALL (*Jour. Amer. Med. Assoc., 94 (1930), No. 16, pp. 1189–1194*).—This is a contribution from the U. S. D. A. Bureau of Animal Industry presented at the annual meeting of the American Association for the Advancement of Science held at Des Moines, Iowa, in December, 1929.

Germicidal efficiency of chlorine and the N-chloro derivatives of ammonia, methylamine, and glycine against anthrax spores, F. W. Tilley and R. M. Chapin (*Jour. Bact., 19 (1930), No. 4, pp. 295–302*).—Chlorine, in neutral, acid, and alkaline solutions, and the N-chloro derivatives of ammonia, methylamine, and glycine were tested against spores of *Bacillus anthracis*. Nitrogen trichloride, chlorine in neutral solution, and chlorine plus N/50 hydrogen chloride were effective in 15 minutes with available chlorine concentrations of 10 parts per million or less. Chlorine plus N/50 sodium hydroxide was not effective in two hours with 100 parts per million available chlorine. Monochloro-amine and dichloro-amine were effective with 80 parts per million available chlorine in 45 minutes and 30 minutes, respectively. Dichloromethylamine and dichloro-glycine were effective with 50 parts per million available chlorine in 30 minutes and 45 minutes, respectively. Monochloromethylamine and monochloro-glycine were not effective in 2 hours with 200 and 240 parts per million available chlorine, respectively.

Periodic ophthalmia in solipeds and its relation to uveitis in man, E. C. Rosenow and F. P. Lewis (*Jour. Amer. Med. Assoc., 91 (1928), No. 9, pp. 621–625*).—Further studies of periodic ophthalmia, which follow a brief review of the literature, are reported under the headings of results of cultures of material from within affected eyes, from the conjunctival sac, and from feeds, and animal experiments. The work has led to the conclusion that the organism isolated, previously described by Rosenow as *Flavobacterium ophthalmiae* (E. S. R., 58, p. 879), has etiological significance in periodic ophthalmia. The infection in the eye appears to be hematogenous, the portal of entry to be the alimentary tract, and the source of the organism various feeds and water.

Notes on the bacteriologic findings in panophthalmia in a deer, J. Traum and B. S. Henry (*Cornell Vet., 19 (1929), No. 1, pp. 62–64, fig. 1*).—In examining the eyes and one kidney of a deer affected with panophthalmia at Hollister, Calif., the authors isolated *Flavobacterium ophthalmiae*, the Gram-negative rod first incriminated by Rosenow (E. S. R., 58, pp. 75, 879) and by Rosenow and Lewis, above noted, as the cause of periodic ophthalmia.

Preliminary observations on the morphology and life-history of Spirochaeta anserina, R. Knowles, B. M. Das Gupta, and B. C. Basu (In *Far East. Assoc. Trop. Med., Trans. 7. Cong., Brit. India, 1927, vol. 2, pp. 573–581*).—The authors deal with the life cycle of *S. anserina*, first in the vertebrate host and then in the invertebrate host.

A case of human tuberculosis of the cervical glands caused by the avian tubercle bacillus, M. B. Soparkar (In *Far East. Assoc. Trop. Med., Trans. 7. Cong., Brit. India, 1927, vol. 2, pp. 425–431*).—The case here described and others referred to show that tuberculous infection in the human subject may be caused by the avian bacillus. The study of the cultural characters and the results of infection of rabbits and fowls, here reported, left no doubt that the avian strain was involved.

Undulant fever bacterial vaccine (*Jour. Amer. Med. Assoc., 94 (1930), No. 17, pp. 1304, 1305*).—A review of the literature on the subject is followed by a report of seven cases treated with vaccine with apparent benefit in several of the cases.

Brucella abortus infection in a male bison, G. T. Creech (*North Amer. Vet., 11 (1930), No. 1, pp. 35, 36*).—The occurrence of *B. abortus* infection in a male bison which came under the author's observation is reported upon.

Brucella agglutinins in the blood and milk of cows, R. Graham and F. Thorp (*Jour. Infect. Diseases, 46 (1930), No. 3, pp. 260–262, fig. 1*).—It appears that a negative agglutination test with milk serum is not a reliable indication of the Brucella agglutinin content of the blood of the same animal. Agglutination with the milk serum detected from 47 to 68 per cent of the cows in two Brucella-infected herds whose blood serum reacted. These observations tend to confirm the generally accepted limitations of the milk serum test for Brucella agglutinins in the diagnosis of this infection in cattle.

The bacillus of bovine abortion as a cause of disease in equines [trans. title], J. VAN DER HOEDEN (*Tijdschr. Diergeneesk., 57 (1930), No. 1, pp. 15–36, figs. 2, Ger., Eng., Fr. abs., pp. 34–36; abs. in Vet. Rec., 10 (1930), No. 12, p. 267*).—In tests made of sera from 424 horses for *Brucella abortus* 99 gave agglutinations when diluted at 1 to 50, 50 at 1 to 100, 18 at 1 to 200, and 3 at 1 to 400. Six animals affected with fistulous lesions of the neck and 13 with fistulous withers gave positive reactions. In some the agglutinative titer was very high, and in all with one exception it exceeded 1 to 100. From 8 of the 12 samples of pus from fistulous withers and from 1 of 3 fistulous neck *B. abortus* was obtained either directly or after passage through the guinea pig. Several times a pure culture of *B. abortus* was obtained from abscesses of withers which had been opened aseptically and in the pus of fistulous neck. The investigations confirm the supposition of Rinjard and Hilger (E. S. R., 61, p. 472), who had isolated *B. abortus* from 2 out of 3 samples of pus from withers.

Infectious abortion of cattle, H. WELCH (*Montana Sta. Circ. 137 (1930), pp. 14*).—A practical summary of information on the disease and its control.

Contagious abortion, J. W. BARTLETT (*New Jersey Stas. Rpt. 1929, p. 109*).—A brief account is given of the work of eliminating infectious abortion from the station herd after 23 per cent of the cows of milking age, or 18 per cent of the total animals in the herd, had reacted positively to the agglutination test. They were tested three times during the year, the reacting animals being isolated in separate dairy barns and maintained as a positive herd.

The treatment of anaplasmosis in the bovine [trans. title], C. P. A. DIEBEN (*Nederland. Indische Bl. Diergeneesk., 41 (1929), No. 3, pp. 265–270, Ger., Eng. abs., pp. 269, 270; abs. in Trop. Vet. Bul., 17 (1929), No. 4, p. 117*).—An account of the treatment of anaplasmosis practiced by the author at Weltevreden, Java.

A focus of anaplasmosis in France [trans. title], E. LECLAINCHE (*Rev. Gén. Méd. Vét., 39 (1930), No. 458, pp. 83–85; abs. in Trop. Vet. Bul., 18 (1930), No. 2, pp. 51, 52*).—The author records the occurrence of several cases of anaplasmosis in October, 1929, in two Departments in France in bovines kept with animals vaccinated in 1928 or in the summer of 1929 against the disease. The cases, which were found exclusively in animals that had been vaccinated against foot-and-mouth disease, resulted from contamination due to a faulty technic and were not cases of natural transmission.

Studies in the prevention of milk fever, J. R. GREIG (*Vet. Rec., 10 (1930), No. 14, pp. 301–305, figs. 4*).—In a study of 82 cases of milk fever at the Animal Diseases Research Institute, Moredun, Edinburgh, Scotland, it was found that the disease is invariably accompanied by a pronounced fall in the blood calcium values. "This finding has been controlled by an examination of 34 normals and 81 cases of bovine disease other than milk fever. Inflation of the udder produces a rapid and regular rise in the blood calcium values, and this rise is concurrent with, and bears direct relation to, the disappearance of the symptoms of the disease. Injection of calcium gluconate elicits specific curative response in milk fever. It is concluded that the essential nature of milk fever is acute calcium deficiency. The salient features of calcium metabolism are discussed. It is considered probable that the occurrence of the disease may be partially controlled by ensuring an adequate supply of calcium in the ration, but on the available data no definite conclusion can be formed. While the injection of preparations of the parathyroid glands is unlikely to eventuate in a method of prophylactic value, the simultaneous injection of parathyroid principle plus calcium gluconate may yet prove a practical measure. The hitherto empirical method of prevention, which consists in allowing the udder to remain firmly distended with milk for the 72 hours succeeding calving, may now be regarded as rational in that it prevents the sudden transference of large quantities of calcium from the blood to the milk."

It is concluded that the subcutaneous injection of calcium gluconate can abort the milk fever attack. Evidence is submitted that calcium injection immediately after calving and preferably reinforced by a second injection about 24 hours later would prove a preventive treatment.

Studies on bovine mastitis.—II, Diagnosis by means of the reaction of the milk to brom-cresol-purple, A. W. Stableforth (*Jour. Compar. Path. and Ther., 43 (1930), No. 1, pp. 22–39*).—In this second contribution (E. S. R., 62, p. 668), brom-cresol-purple was used to indicate the reaction of most of the samples of milk examined. While a suitable agent for this purpose, it was found that accurate readings are more easily made with brom-thymol-blue.

Specific infectious pyelonephritis of cows, C. D. Rice (*Iowa Acad. Sci. Proc., 34 (1927), pp. 87, 88*).—A brief reference is made to five cases of pyelonephritis of the cow observed during the last three years in a clinic at Ames, Iowa, all of which proved fatal.

Cows infected with Streptococcus epidemicus (Davis), W. D. Frost, R. C. Thomas, M. Gumm, and F. B. Hadley (*Jour. Infect. Diseases, 46 (1930), No. 3, pp. 240–252*).—Seventeen cows are reported upon in this paper which were shedding *S. epidemicus* in their milk, of which 2 were associated with an epidemic of septic sore throat.

The work reported indicates that cows infected with *S. epidemicus* are rather generally and widely distributed, and that this streptococcus undoubtedly occurs quite generally and frequently in milk used for direct consumption as well as that which is used for cheese and butter making without producing disease. "The infection of cattle with this human type of streptococcus apparently begins as a mild disease which may become very severe or apparently continue a mild course. There is a tendency for the infected portions of the udder to lose their milk-secreting function. In the group of mild cases to which most of our cows belong, there is little or no change from the normal in either the udder or the milk, although *S. epidemicus* may be shed in large numbers. Of the 13 cows in which the extent of the infection was determined, 7 cows, 53 per cent, were infected in only one quarter, 4 cows, 31 per cent, were infected in two quarters, and 2 cows, 16 per cent, were infected in three quarters, although the infection in the different quarters did not always occur simultaneously. The strains of *S. epidemicus* are apparently all virulent and are identical with those strains isolated from epidemics from either man or cow."

Natural transmission of heart-water of sheep by Amblyomma variegatum (Fabricius 1794), R. Daubney (*Parasitology, 22 (1930), No. 2, pp. 260–267, pls. 2, figs. 3*).—The observations here recorded show that the heartwater of lambs in Kenya Colony can be transmitted naturally by the adult stage of the tick *A. variegatum*. The incubation period after infestation with infected ticks is about 3 weeks, and after direct blood inoculation from a reacting animal it is usually from 9 to 12 days.

B. paludis: A new species of pathogenic anaerobic bacterium, A. D. McEwen (*Jour. Compar. Path. and Ther., 43 (1929), No. 1, pp. 1–21*).—The author has isolated a new pathogenic sporulating anaerobic organism from 12 cases of disease in sheep in which the muscular tissue presented lesions characteristic of those produced by the pathogenic sporulating anaerobic bacteria. To this the name *Bacterium paludis* is given. In 5 of the cases *B. paludis* was present in the infected muscular tissue in pure culture, and in all 12 cases smears from the muscular tissue showed the organism to be present in large numbers. This organism, considered to have been the cause of the disease which resulted fatally, presents many features in common with *B. welchii*, but they differ particularly in the specificity of their toxins.

A contribution to the study of the piroplasmoses of sheep: First observations of babesiellosis in France [trans. title], J. Cuillé, E. Darraspen, and P. Chelle (*Rev. Gén. Méd. Vét., 39 (1930), No. 458, pp. 65–83, figs. 28*).—The authors confirm earlier reports of the occurrence of piroplasmosis of sheep in France, and conclude that piroplasmid affections occur in the country much more frequently than has been generally supposed. A systematic study of the blood parasites of sheep indicates that certain little known affections are associated with babesiellosis.

On the presence of the bacillus of Preisz-Nocard in infected shear-cut wounds in sheep, T. T. McGrath (*Aust. Vet. Jour., 5 (1929), No. 4, pp. 148, 149*).—The author reports the isolation of the Preisz-Nocard bacillus from pus present in three out of four infected shear cuts examined.

An epizootic disease of elk, O. J. Murie (*Jour. Mammal., 11 (1930), No. 2, pp. 214–222, pls. 2*).—A disease of elk occurring in Jackson Hole, Wyo., from which 409 head were lost during the winter of 1927–28 and 76 during the winter of 1928–29, is reported upon. It was found by the U. S. D. A. Bureau of Biological Survey to result in the majority of cases from lesions caused by grass seeds in the mouth and the suppuration with the entrance of *Bacillus necrophorus* which followed. The seeds were identified as seeds of *Hordeum nodosum* with a lesser amount of *Bromus tectorum*. The presence of squirreltail grass in the hay is considered the most serious factor.

Parasites of elk and other wild ruminants, M. C. Hall (*Jour. Wash. Acad. Sci., 20 (1930), No. 5, pp. 87, 88*).—This is a brief abstract of a paper presented on December 14, 1929, in which it is pointed out that the parasites of wild ruminants are of interest in connection with their actual or potential transfer from these ruminants to domesticated livestock, especially sheep, goats, and cattle, and as forms which have transferred from domesticated livestock to wild ruminants.

Swine sanitation, L. Van Es (*Nebraska Sta. Circ. 39 (1930), pp. 14*).—This is a practical summary of information on swine sanitation.

Types of tubercle bacilli in swine tuberculosis, R. L. Cornell and A. S. Griffith (*Jour. Compar. Path. and Ther., 43 (1930), No. 1, pp. 56–62*).—The author reports that natural tuberculosis in swine may be the result of infection with bovine, avian, or human tubercle bacilli, with the bovine type the chief cause. The avian tubercle bacillus is responsible for a considerable proportion of the cases in which the tuberculosis is apparently confined to the lymphatic glands of the alimentary tract. These findings corroborate those of other workers, and support their recommendation that pigs and poultry should not be allowed to run together over the same ground.

Experimental infection of horses with Leptospira icterohaemorrhagiae [trans. title], O. Nieschulz and F. K. Wawo-Roentoe (*Tijdschr. Diergeneesk., 57 (1930), No. 5, pp. 282–291, figs. 2; Ger., Fr., Eng. abs., pp. 290, 291*).—Two young horses were infected, the first with 12 cc. of a virulent culture of a human strain of *L. icterohaemorrhagiae*, the causative agent of Weil's disease, and the second with 130 cc. of blood of the first horse. Leptospirae were found in the blood and urine of both horses, being easily detected with the microscope. They could not surely be found from the thirteenth day in the first horse, nor in the organs after autopsy made on the twenty-second day following infection. Horses recovering from the disease apparently do not remain carriers of the leptospirae. The serum of the first horse commenced to show a lysis on the sixth day. On the twelfth day the titer was increased up to 1:100,000, but on the twenty-second day it had fallen again to 1:25,000. The serum showed a lysis directly after the appearance of the top of the temperature curve, and when the lysis itself had reached its maximum the leptospirae disappeared definitely from the blood and urine.

Diseases of poultry, E. Brown (In *Poultry breeding and production, II. London: Ernest Benn, 1929, vol. 2, pp. 827–848*).—This is a practical summary of information based particularly upon conditions met with in England.

Report of the poultry pathologist (*New Jersey Stas. Rpt. 1929, pp. 288–298*).—Following a brief reference to the diagnostic work of the year, experimental work is reported under the headings of epidemiological studies of fowl cholera (E. S. R., 61, p. 769), studies on avian paratyphoid organisms, and a study of poultry diseases in New Jersey, including the outbreak and eradication of fowl plague. An account of bacillary white diarrhea control work is followed by the results of work at the south Jersey laboratory under the headings of fowl pox and tapeworm and miscellaneous experiments.

Observations on the experimental epidemic started on March 30, 1928, were continued (E. S. R., 61, p. 770) through February, 1929, a bird being added to the population each day until October 18, 1928. The epidemic was started by inoculating each of 20 birds intranasally with the same dose of fowl cholera organisms. Up to July 1, 1928, the mortality in the population was 16 birds, of which only 3 died of fowl cholera, and 2 of these were birds which had been added to the population, thus indicating a spread of infection. The population was swabbed for the first time on April 10, 1928, at which time the carrier rate was 17.85 per cent. All of the carriers were confined to the originally inoculated birds. The next swabbing was done on May 8, at which time the carrier rate was 32.69 per cent, and of the 17 carriers detected at this time 10 were among the added birds. The swabbing made June 19, 1928, revealed a carrier rate of 12.98 per cent, and of the 10 carriers detected 9 were in the added birds. Seven of these carriers were birds which had been added since the previous swabbing. The mortality from July 1, 1928, through February, 1929, was 46 birds, of which only 8 died from fowl cholera. The swabbing made on July 17, 1928, revealed a carrier rate of 21.42 per cent, and that made on August 23 a carrier rate of 20.95 per cent. The last three swabbings were done on October 23, November 8, and January 3.

Repeated swabbings show that when the carrier state is once acquired it is not necessarily maintained. Some birds are quite persistent carriers, others were shown to be carriers only on one occasion, whereas still others were never demonstrated to be carriers. This observation would seem to indicate that there is a wide variation in the degree of resistance to this infection. The organism used to inoculate the original 20 birds was a strain obtained from an outbreak of fowl cholera on Long Island, which appeared to be a fluorescent type and should have been quite pathogenic, but the inoculation of the original 20 birds, however, resulted in the death of only 1 five days after the inoculation. Of the remaining 9, 5 were found to be carriers of infection when the population was swabbed 13 days later. While the type used for the original inoculation was a fluorescent one, the strains isolated from fatal cases as well as from the carrier birds were, in the majority of cases, blue types or intermediate ones.

Another experimental epidemic was started February 8, 1929, in which 20 birds were inoculated intranasally with a Kansas strain of the organism. Two days later 3 birds died of fowl cholera, and other deaths followed. The high degree of resistance shown by some birds to experimental inoculation, as manifested by their ability to throw off infection without even showing symptoms of disease, suggested the possibility of breeding a strain of birds highly resistant to this infection, and work was commenced.

Several quail received from a game farm in the State were found parasitized by two species of nematodes, one of which (*Dispharynx spiralis*) had not previously been reported from this host.

In work with fowl pox, in which 7,703 birds were vaccinated, quite satisfactory results were obtained.

Selective media for the cultivation of Bacillus pullorum and Bacillus sanguinarium, W. R. Kerr (*Jour. Compar. Path. and Ther., 43 (1930), No. 1, pp. 77–85*).—It is concluded that the routine plating of feces on brilliant green agar plates is a valuable aid to the diagnosis of bacillary white diarrhea, and when used in conjunction with existing laboratory routine methods, will reduce the percentage of error in diagnosis very considerably. Brilliant green inhibits a great many of the coliform group which are normal saprophytes in the intestinal canal of even very young chicks, and it inhibits all Gram-positive organisms. Brilliant green media may be used successfully for the diagnosis of " carriers " among adult fowls. *B. pullorum* may be present in the intestinal canal, producing a chronic enteritis, and yet not be present in the ovaries. Brilliant green fluid medium may be used with great success in conjunction with a differential medium for the examination of the feces of chicks. *B. pullorum* may remain viable in moist feces for a period of 101 days. *B. pullorum* may be found in the feces when liver cultures have given negative results, thus explaining the occasional failure to diagnose bacillary white diarrhea when the mortality is due to *B. pullorum*. The selective media may be used for the diagnosis of *B. pullorum* from carcasses in all stages of putrefaction up to and including 30 days after death. Brilliant green medium may also be used in the diagnosis of fowl typhoid and in demonstration of carriers of this disease.

The isolation of Salmonella pullorum from the liver, heart's blood, and yolk of young chickens, H. C. H. Kernkamp (*Poultry Sci., 9 (1929), No. 1, pp. 13–18*).—The results of a study conducted at the Minnesota Experiment Station, here reported, show that *S. pullorum* can be isolated from the livers of affected baby chickens in a large percentage of the cases, 92 per cent in down-covered chicks and 76.7 in chicks from 3 to 8 weeks of age. The organism was isolated an average of 73.4 per cent of the times from the yolk and 66.3 per cent from the heart's blood in the down-covered chicks, while in the chicks ranging from 3 to 8 weeks of age the corresponding percentages were 39.6 and 50.5.

Preliminary report on an outbreak of fowl paralysis in England, C. A. McGaughey and A. W. Downie (*Jour. Compar. Path. and Ther., 43 (1930), No. 1, pp. 63–76, figs. 9*).—In reporting upon an outbreak of paralysis in poultry which occurred in England in the fall of 1927, a summary of knowledge of the disease is presented in connection with a detailed report of 10 cases.

Immunisation of fowls against fowl pox by means of pigeon pox virus, T. M. Doyle (*Jour. Compar. Path. and Ther., 43 (1930), No. 1, pp. 40–55, figs. 2*).—In experimental work with pigeon pox virus it was found to confer a solid immunity in fowls against natural infection with fowl pox, the immunity being fully established about the fourteenth day after inoculation. "The vaccine confers considerable, but not complete, protection against severe artificial infection with fowl pox virus. It prevents generalization of infection, and the lesions usually clear up quickly. This is in contrast with the generalization of infection, accompanied by loss of condition and heavy mortality, which occurs in nonvaccinated fowls. The vaccine does not give rise to any constitutional disturbance, loss of condition, or, as far as has been ascertained, interfere with egg production. Susceptible fowls do not contract infection when kept in contact with fowls exhibiting active pigeon pox lesions on the comb, mouth, or skin. The virulence of pigeon pox virus for fowls can be exalted by serial passage through fowls. In pigeon pox virus we possess a valuable agent for the protection of fowls against natural infection with fowl pox. When employed in conjunction with hygienic measures, it should bring about a marked and rapid reduction in the incidence of the disease."

Immunisation of fowls against tuberculosis with B. C. G. vaccine, T. M. Doyle (*Vet. Jour., 86 (1930), No. 657, pp. 90–96*).—The author finds that the B. C. G. vaccine (bovine strain) does not protect fowls against a subsequent intravenous inoculation of virulent avian tubercle bacilli.

Blackhead in turkeys—surgical control by cecal abligation, A. J. Durant (*Missouri Sta. Research Bul. 133 (1930), pp. 32, figs. 6*).—The author here summarizes the work conducted in combating blackhead in turkeys through cecal abligation, progress reports of which have been noted (E. S. R., 60, p. 876).

It has been found that the ceca may be separated from the main gut by three distinctly different operations. "(1) By ligating the two ceca near the point where they branch from the main intestine (true abligation). (2) Each cecum is bisected near the point where it branches from the main intestine. The stumps are then turned inward and the lumen of each closed with Lembert sutures. (3) The ceca are extirpated and the lumen of each of the two intestinal stumps are closed as described in (2).

"Cecal abligation was designated as the most appropriate term for the operation described. Mortality from the operation varies from 13.6 per cent to 60.3 per cent, the average being 47 per cent. Immediate cause of the mortality is due to the fact that the stumps at the point of the operation fail to seal over and a 'leak' results, causing peritonitis. The operation permanently separates the ceca from the main gut, but does not retard their growth and development. In approximately 42 per cent of cases the ceca become greatly enlarged in 7 to 32 months after they are separated from the main digestive tract. The cause of this has not been determined, though *B[acillus] coli communior* isolated in pure culture from the contents of the enlarged organs may have some etiological relation.

"The utilization of food by abligated turkeys is the same as for unabligated birds. During the 3-year period 60 birds were completely abligated and exposed with 45 controls unabligated. The 60 abligated birds all remained healthy, while 37 of the 45 controls contracted the disease. The partially abligated birds were more than twice as resistant to enterohepatitis as unabligated birds."

The rook as a source of gapeworm infection, J. P. Rice (*Jour. Min. Agr. North. Ireland, 2 (1929), pp. 84–87*).—Examinations extending over a period of 5 years of rooks (*Corvus frugilegus*), which invade poultry runs in Northern Ireland, have shown them to be heavily infested with gapeworms indistinguishable from *Syngamus trachealis* occurring in the chicken. In May 98 per cent of those shot were found infested, in June 85 per cent, and in August 62 per cent. In a careful control experiment it was proved that this gapeworm can cause gapes in chickens and is an important potential cause of loss.

The chemotherapy of experimental streptococcic infection in the rabbit [trans. title], URBAIN and CHAILLOT (*Rec. Méd. Vét., 105 (1929), No. 12, pp. 911–917*).—The authors find that rabbits can be protected against experimental infection with streptococci in from 40 to 50 per cent of the cases by novarsenobenzol, gonacrine, sodium salicylate, and arthrytin. The only substances which have had a curative action are novarsenobenzol, cardyl, and gonacrine.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Louisiana Stations] (*Louisiana Stas. [Bien.] Rpt. 1928–29, pp. 15–18*).—An investigation of the milling of high-fibered sugarcane by W. Whipple showed the benefits of coarse grooving and special grooves as well as the use of revolving cane knives.

Whipple and H. T. Barr, in the studies of the artificial curing of hay, designed and built a revolving drum type of continuous hay drier having a capacity of 0.25 ton of dry hay per hour. During the year a larger drier with a drum 6 by 40 ft. was built along the same lines as the original drier, and with maximum capacities of 2,600 lbs. of dry alfalfa hay and 1,600 lbs. of dry soybean hay per hour. An evaporation of 8 lbs. of water per pound of oil was obtained, which is equivalent to an efficiency of 50 per cent.

Barr reported that planters and cultivators for the general purpose tractor have been found only fairly successful, and that several changes have been necessary in order to secure better results under conditions as found on the alluvial lands of the cane belt. The costs of production secured are under those as reported by a survey made by the U. S. Department of Agriculture on 25 farms in the alluvial section of Louisiana. The results are tabulated.

Surface water supply of the United States, 1926, I, IX, XII (*U. S. Geol. Survey, Water-Supply Papers 621 (1930), pp. VI+274, fig. 1; 629 (1930), pp. V+38, fig. 1; 632 (1930), pp. V+154, fig. 1*).—Part 1 of this report, prepared in cooperation with the States of Maine, New Hampshire, Massachusetts, New York, New Jersey, Maryland, and Virginia, presents the results of measurements of flow made on streams in the North Atlantic slope drainage basins during the year ended September 30, 1926. Part 9, prepared in cooperation with the States of Colorado, Wyoming, Utah, California, and Arizona, and part 12, prepared in cooperation with the States of Washington, Montana, and Idaho, present corresponding results for this period for streams in the Colorado River Basin and streams in the Pacific slope basins in Washington and in the upper Columbia River Basin, respectively.

Geology and water resources of the Mokelumne area, California, H. T. STEARNS, T. W. ROBINSON and G. H. TAYLOR (*U. S. Geol. Survey, Water-Supply Paper 619 (1930), pp. XII+402, pls. 21, figs. 33*).—This report presents the progress results of an investigation of the geology and water resources of an area of approximately 615 square miles lying about 25 miles south of Sacramento in California.

The report includes all the available records of the surface water of the area. The principal streams are the Mokelumne River, Dry Creek, and Bear Creek. Only the Mokelumne River is perennial, and its average annual run-off is about 800,000 acre-ft. Records of all diversions from the Mokelumne River are given, including detailed descriptions of 57 pumping plants and the crops irrigated by them. These plants divert about 3,500 acre-ft. per annum. In addition, the Woodbridge Canal diverts about 35,000 acre-ft. for irrigation of the Woodbridge irrigation district.

A record of 2,001 irrigation pumping plants on wells, including the area and kinds of crops irrigated, is given. The area irrigated by the use of ground water has progressively increased from 4,300 acres in 1909 to 45,800 acres in 1927. Tests on the use of water by 53 pumping plants on wells for the principal crops of the area are described in detail. The average use of water on orchard and vineyard land, exclusive of precipitation, was found to be about 1.3 acre-ft. per acre per year, and for alfalfa and miscellaneous garden crops about 3 acre-ft. per acre. From these figures it was computed that 64,800 acre-ft. is pumped annually from the ground for irrigation. In addition, about 6,000 acre-ft. is pumped for domestic use and stock.

Tests of specific yield were made on undisturbed soil columns and are described in detail. They indicate a specific yield of less than 25 per cent for the water-bearing material. The principal aquifers are the arkosic sand strata of the younger alluvium. Good irrigation supplies are generally obtained at depths between 100 and 200 ft., and domestic supplies at less than 100 ft.

Surface water supply of Missouri River Basin, 1925 (*U. S. Geol. Survey, Water-Supply Paper 606 (1930), pp. VI+252, fig. 1*).—This report, prepared in cooperation with the States of Montana, Wyoming, Colorado, Iowa, Kansas, and Missouri, presents the results of measurements of flow made on streams in the Missouri River Basin during the year ended September 30, 1925.

Surface water supply of Hawaii, July 1, 1924, to June 30, 1925 (*U. S. Geol. Survey, Water-Supply Paper 615 (1930), pp. IV+155*).—This report, prepared in cooperation with the Territory of Hawaii, presents the results of measurements of flow made on streams and ditches during the year ended June 30, 1925.

Studies on the movement of water in soils [trans. title], M. CONTI (*Rev. Facult. Agron. La Plata., 3. ser., 17 (1927), No. 3, pp. 257–275, figs. 10*).—The results of comparative studies of the hydraulic properties of arable soils to provide a basis for the rational distribution of irrigation water are reported. The studies included laboratory determinations of the velocity of vertical and lateral percolation of irrigation water in different soils, determination of the powers of absorption and retention of water, determination of the depth of penetration of irrigation water under different heads, and determination of capillarity factors under irrigation conditions.

It was found that the quantity of water absorbed by soil is proportional to its contents of humus, clay, and fine sand in relation to the coefficients 3, 2, and 1, respectively. Depth of penetration was found to be nonuniform, and to vary somewhat with the fineness of the soil. The velocity of vertical penetration was more rapid in dry soils than in moist soils. The ratio of the two velocities of penetration was higher in soil rich in clay and fine material, and lower in soils rich in sand and organic matter.

Vertical penetration of irrigation water was found to be four times as rapid as lateral penetration in soil of uniform composition. Nonuniformity of soil composition caused vertical and lateral movements to become more nearly equal, especially where the humus content was high.

Drain-line spacing in the drainage of mineral soils [trans. title], ROTHE (*Kulturtechniker, 32 (1929), No. 2, pp. 155–169, figs. 3*).—A summary is presented of the available data relating to drain spacing, and an analysis is made with particular reference to the requirements of mineral soils in northern Germany, some experimental results being reported. It is recommended that in northern Germany drain-line spacing for drainage at a depth of 1.25 meters be determined according to the formula $E=\frac{117}{W}=\frac{638}{W_E}$, in which W is the hygroscopicity of the soil and W_E is the percentage of settleable particles.

Development and present position of mole draining (*Internatl. Rev. Agr. [Rome], Mo. Bul. Agr. Sci. and Pract., 20 (1929), No. 5, pp. 192–196, figs. 10*).—The present status of mole draining is briefly outlined, attention being drawn to different mole draining practices, particularly in Europe. It appears that mole draining has been attended with considerable success, although the life of the channels varies widely. Experiments on the lining of the drains with pipes have so far not proved very successful. A bibliography is included.

Research in land reclamation, 1928, R. W. Trullinger (*Agr. Engin., 11 (1930, No. 4, pp. 145, 146*).—In a contribution from the U. S. D. A. Office of Experiment Stations a brief review of progress in land reclamation research in 1928 is presented.

"The viewpoint on land reclamation seems to have undergone considerable of a change during recent years. It appears that the tendency is now not so much toward the reclamation and agricultural development of waste, timbered, and otherwise marginal lands, but is instead to more or less concentrate on the conservation and better utilization of the resources of the better agricultural lands already available."

Rapid transformation of rocks into arable soil by the use of agricultural explosives [trans. title], A. Piédallu (*Compt. Rend. Acad. Agr. France, 16 (1930), No. 7, pp. 247–250*).—The results of two years' experiments on the pulverization of very compact calcareous sandy loam soils and calcareous rocks by the use of agricultural explosives are briefly summarized. Charges of from 1 to 3 cartridges containing from 100 to 125 gm. of explosive each were placed at depths of from 1 to 1.5 meters and spaced 2 meters longitudinally and 1 meter laterally. The simultaneous explosion of 4 or 5 charges pulverized the soil and reduced the rocks to a grain size suitable for arable soil. With proper supplemental fertilization the production of satisfactory potato crops was possible. The conclusion is drawn that the natural infertility of such soils is due more to their compactness than to their composition.

Strength of materials, A. P. Poorman (*New York and London: McGraw-Hill Book Co., 1929, 2. ed., pp. XIII+348, figs. 214*).—This is the second revised edition of this book (E. S. R., 54, p. 580), which is based on work done at Purdue University.

Some additional factors in the prediction of the tensile strength of sand mortars, H. W. Leavitt, J. W. Gowen, and W. S. Evans (*Maine Univ., Technol. Expt. Sta. Bul. 24 (1930), pp. 12, fig. 1*).—These experiments led to the conclusion that the mechanical analysis data, the percentage of mixing water, and the colorimetric test for organic impurities of sands give valuable information for the prediction of the 28-day tensile strength of sand mortars. Other important factors must be measured, however, in order to make more accurate predictions.

The effect of sulfur on the physical properties of gray iron, E. K. Smith and F. B. Riggan (*Amer. Soc. Testing Materials Proc., 28 (1928), pt. 2, pp. 205–217, figs. 12*).—Studies are reported which showed that the strength and fluidity of gray iron are not affected by sulfur, even in great excess. Brinell hardness and combined carbon are increased by sulfur, while machineability is correspondingly decreased.

Microscopic examination showed increasing sulfide areas, believed to be iron sulfide in solution in manganese sulfide, with gradual transition from normal gray iron to austenitic hard iron. There was evidence of solution of iron sulfide in iron carbide, and where the sulfur was very high of precipitation of iron—iron sulfide eutectic. Strong evidence was also obtained that sulfide can be reduced materially by the addition of manganese with the charge.

The belief is expressed that many defects attributed to sulfur have been due to other causes, and that with a proper percentage of manganese, sulfur has little effect on gray iron, at least up to 0.18 per cent.

Structural engineering, G. F. Swain (*New York and London: McGraw-Hill Book Co., 1927, pp. X+525, figs. [447]*).—This volume deals with the theory of statically determined frame structures, by analytical and graphical methods, and with the theory and design of masonary structures, giving the fundamental principles and the methods of their application. The theory of earth pressure is discussed also.

Draft tests with horses, F. J. J. van Rijn (*Trekproeven bij Paarden. Proefschr., Rijks-Univ., Utrecht, 1929, pp. 282, pls. 5, figs. 12*).—This publication records the results of extensive tests of the tractive power and working capacity of horses in the Netherlands. A detailed description of the technic employed in the tests and the testing apparatus is included, some of which was developed at American agricultural experiment stations.

The general conclusion is that a good horse with good footing can exert a draft of between 75 and 85 kg. (165 and 187 lbs.). In normal agricultural operations the draft may be as high as 100 kg. For an 8- to 10-hour working day a farm horse can exert a draft of 100 kg. at a speed of 1.25 meters (4.1 ft.) per second. A good driver is essential to high draft and working capacity of a horse, and an even temperament of the horse is equally essential.

Report upon the use of agricultural machinery and the organization of agricultural labour in Australia, New Zealand, and Canada, A. Amos and J. Garton (*[Gt. Brit.] Min. Agr. and Fisheries Misc. Pub. 67 (1929), pp. 43, pls. 2*).—This report summarizes the results of observations on the use of labor-saving machinery and methods in farming operations in Australia, New Zealand, Canada, and the United States, and discusses the possibility of their similar use in England.

Windlass tractors and motor windlasses (*Internatl. Rev. Agr. [Rome], Mo. Bul. Agr. Sci. and Pract., 20 (1929), No. 7, pp. 278–280, figs. 4*).—A description is given of windlass tractors and motor windlasses especially adapted for vineyard work in Europe. Windlasses have been found especially useful in sloping vineyards, and portable motor windlasses have been used with excellent results in Germany. A short bibliography is included.

Nebraska tractor tests, 1920–1929 (*Nebraska Sta. Bul. 242 (1930), pp. 27, pl. 1, fig. 1*).—This bulletin summarizes the results of 61 tractor tests and includes data on all tractors reported by their manufacturers as on the market January 1, 1930 (E. S. R., 61, p. 178).

Plow tests [trans. title], S. V. Kamenetskiĭ (Kamenetsky) (*Sev. Kavkaz. Kraev. Selsk. Khoz. Opytn. Sta., Biul. 275 (1929), pp. 40, figs. 29; Eng. abs., pp. 39, 40*).—Laboratory and field tests of several single-bottom horse plows are reported. It was found that the semiscrew form of moldboard operated fairly successfully on soils of medium compactness. Plows on which the soil did not move smoothly from the share to the moldboard proved unsatisfactory when operating on soil of medium compactness.

The influence of plowing with a milling cutter, a tiller, and a plow on the spread of weeds [trans. title], I. Shakhnov (Shahnov) (*Sev. Kavkaz. Kraev. Selsk. Khoz. Opytn. Sta. Biul. 297 (1929), pp. 26, figs. 4; Eng. abs., pp. 25, 26.*)—Tests of a 35-h. p. milling cutter, a tiller plow with vertical crushers, and a tractor plow are reported. It was found that the milling cutter rendered the whole upper soil friable without turning it up sufficiently, thereby creating favorable conditions for the development of annual weeds. It destroyed and severely injured the roots of perennial weeds. The tiller provided the most favorable conditions for the development of all kinds of vegetation, including both crops and weeds. The total amount of weeds following the use of the tiller was about 17 per cent greater than after a milling cutter, and about 33 per cent greater than after a plow.

Grain losses when harvesting with different harvesting machines [trans. title], N. I. KALININ (KALININE) (*Sev. Kavkaz. Kraev. Selsk. Khoz. Opytn. Sta. Bul. 295 (1929), pp. [24], figs. 10; Eng. abs.,; p. [24]*).—The results of a series of experiments conducted in 1926 and 1927 at the North Caucasian Regional Agricultural Experiment Station in Russia to determine grain losses occurring during harvesting with the sickle, scythe, Russian harvester, binder, and combine are reported. Winter and spring wheat, barley, and oats were harvested during these experiments. The heaviest loss occurred when harvesting with the scythe and the Russian harvester. The smallest loss occurred when harvesting with a sickle, but in many cases when harvesting with a binder.

The mechanical corn picker in Ohio, J. H. SITTERLEY (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 24 (1930), pp. [1]+18*).—This mimeographed preliminary report is based on data obtained by interviews in the fall of 1929 with owners of 51 1-row machines (18 wheel drive, 32 power take-off, and 1 auxiliary motor type) and 14 2-row (power take-off) machines.

With 1-row pickers in 1928 the acreage picked varied from 21 to 211 acres, averaging 86.5 acres; the rate of picking varied from 0.44 to 1.1 acres per hour, averaging 0.79 acre; and the average costs, including man labor, horse work, tractor charge, fuel, oil, repairs, depreciation, and taxes, were from 9.5 cts. per bushel for less than 50 acres to 6.2 cts. for 125 acres and over. The average cost of hand husking with one man and team was 12 cts. per bushel. Hand husking required 9.8 hours of man labor and 19.6 hours of horse work per acre, as compared with 3.7 and 4.3 hours, respectively, with 1-row pickers. Full data as to costs for 2-row pickers are not given, but they are estimated to be 40 per cent less than for 1-row machines.

The advantages and disadvantages of mechanical over hand husking are briefly discussed.

[The energy requirements, capacities, and characteristics of grinders used for processing feeds] (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1929–30, pp. 8–12*).—Tests are reported of a triple reduction knife and hammer mill, a single reduction rigid hammer mill, a double reduction knife and hammer mill, and a double reduction knife and plate mill.

The results indicate that knives for the first reduction are very desirable If kept sharp they lower the power cost, produce a more uniform power requirement, and a more uniform fineness of feed. Knives and hammers or knives and buhrs mounted on the same drive shaft, other things being equal, save power.

For the best grinding conditions the peripheral speed of a hammer mill should be around 14,000 to 15,000 ft. per minute. A buhr mill should run from 600 to 850 r. p. m. A mill using a drag elevator requires less power than the same mill equipped with a blower elevator. A blower elevator consumes more power but has a cooling effect on the feed, will carry the feed to greater distances, and, if equipped with a dust collector, eliminates considerable dust. Poor adjustment of the cutter bar may cause a 100 per cent increase in power consumption.

The greatest benefit from grinding forage is derived from the cracking of the grain. Dry roughage when ground will keep longer but is dusty and disagreeable to grind and probably less palatable to stock than feed containing 25 per cent or more moisture.

Results of tests of a continuous process feed grinding plant, J. E. Nicholas (*Agr. Engin., 11 (1930), No. 4, pp. 141–143, figs. 2*).—Studies conducted at the Pennsylvania Experiment Station are reported on grinding feed, elevating, mixing, and bagging in one continuous process.

It was found that the ingredients are satisfactorily mixed at the end of 4 minutes with an approximate energy consumption of ¼ kw. hour. It takes more power and a longer period of time to grind the same kind of material to a low fineness modulus than a high fineness. For example, grinding 96 lbs. of oats with a fineness modulus of 3.11 required only 15 minutes and an energy consumption of 1 kw. hour. It required 22 minutes and 1.77 kw. hours to grind 86 lbs. of oats with a fineness modulus of 2.59. A fineness modulus of 3.11 and 2.59 would be classified in the fineness of grinding as "medium" and "fine," respectively.

Bags can be filled much faster when the mixer screw is in operation, as this stirs the feed and it falls in a continuous stream to the bag. With the mixer screw idle, the feed has a tendency to hang up and it becomes necessary to tap the mixer.

Ventilating stables with electric power, J. L. Strahan and C. A. Marsh (*Agr. Engin., 11 (1930), No. 4, pp. 127–134, figs. 6*).—Experimental data and mathematical analyses are presented which show that so long as no artificial heat is used, and if temperature control is the important function of a ventilating system, the barn design and construction is a vitally important element in the final satisfactory solution of providing a proper environment for producing animals.

It is shown also that there is a point in design for heat conservation that must be reached before satisfaction as measured by moisture control can be obtained. Short of this point success is impossible, but even a very small way beyond it opportunity for control is practically unlimited. This point in design can not be precisely known until further research on animal heat and moisture production under varying environmental conditions of temperature and relative humidity is carried through.

An electric ventilation system is described.

Dairy equipment [trans. title], P. Rüters (*Die Betriebsmittel im Molkereibetriebe. Berlin: Paul Parey, 1929, pp. 127, figs. 78*).—This is a handbook of mechanical equipment for German dairies.

Minimizing heat losses in residences, P. E. Fansler (*Architect. Forum, 51 (1929), No. 1, II, pp. 97–102, figs. 7*).—Data relating to heat losses through walls, glass, roofs, and door and window leaks in dwellings are summarized, and means of reducing them are pointed out. It has been found that the heat loss through walls averages about 27 per cent of the total loss, through glass about 26 per cent, through roofs about 16 per cent, and through other openings about 31 per cent.

Data on the insulating value of different wall constructions are also presented, and testing equipment for determining air and heat flow through different types of construction is described.

Action of enzymes on sewage solids, N. S. Chamberlin (*New Jersey Stas. Bul. 500 (1930), pp. 35, figs. 8*).—A study of enzymes present during digestion of sewage solids was made in an attempt to correlate the different phenomena occurring. A study was made also on the addition of different enzymes to digesting mixtures to determine whether the digestion time could be reduced and either gasification or liquefaction increased. Finally, a study was made of the effect of enzymes on the physical condition (dewatering, swelling) of the sludge.

The studies on the determination of enzymes gave some idea of what occurs during digestion, and showed at what period of digestion certain reactions take place. The quantities of lipase, diastase, and pepsin are closely allied to the digestion of properly seeded mixtures from the standpoint of gasification. Rennet and trypsin occur in quantities in no way related to the gas curve.

The effect of the addition of enzymes on properly seeded mixtures is negligible with the exception of lipase. The added enzymes are apparently either destroyed or remain inactive. It is very likely that the enzymes present would be more active if optimum environmental conditions could be maintained. This, however, is known to be unfeasible and uneconomical.

Lipase is the only enzyme which causes an appreciable change in the physical condition of either the properly seeded or fresh solid digesting mixtures. Lipase causes greater gasification of properly seeded mixtures, and helps the liquefaction and hastens the swelling of fresh solids. Because of this change in physical condition, lipase hinders the dewatering of fresh solids.

RURAL ECONOMICS AND SOCIOLOGY

[Additional papers presented at the twentieth annual meeting of the American Farm Economic Association] (*Jour. Farm. Econ., 12 (1930), No. 2, pp. 213–257, 278–325*).—Included are the following papers and discussions thereon presented at the meeting previously referred to (E. S. R., 62, p. 884): Recent Developments in Research Method and Procedure in Agricultural Economics, by H. R. Tolley (pp. 213–232); Research Relating to Cooperative Marketing, by O. B. Jesness (pp. 233–247); Research Methods in Farm Finance, by A. G. Black (pp. 248–257); Modern Tendencies in Food Distribution, by P. L. Miller (pp. 278, 279); Chain Store Methods of Buying Fresh Fruits and Vegetables, by H. A. Baum (pp. 280–282); Large Scale Selling, by W. H. Baggs (pp. 283–288); Trends in the Distribution of Meats, by E. L. Rhoades (pp. 289–291); The Need of Science to Determine our Trends in Distribution, and of Distribution Engineers to Give Us an Outside Viewpoint of Our Business, by G. C. Corbaley (pp. 292–300); Modern Tendencies in Food Distribution, by V. H. Pelz (pp. 301–310); Some Social and Economic Aspects of Rural Electrification, by H. E. Erdman (pp. 311–319); and Problems Involved and Methods Used in Promoting Rural Electrification, by S. H. McCrory (pp. 320–325).

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul. 144 (1930), pp. 92–96, figs. 2*).—Results are reported as follows:

The dairy feed-milk ratio for northeastern Ohio, J. H. Sitterley (pp. 92, 93).—A table and chart are included showing the Cleveland milk price, feed price per hundredweight, and the equivalent in dairy feed of 100 lbs. of milk for the years 1920–1929.

Land utilization, J. I. Falconer (pp. 93, 94).—A map is given showing by counties the percentage of Ohio land in farms in 1925.

Comparative prices of Ohio farm products, J. I. Falconer (pp. 94, 95).—A table is given showing the average prices of different farm products, 1910–1914, 1925–1928, 1928, and 1929, and indexes of such prices, 1921–1924, 1925–1928, 1928, and 1929.

Index numbers of production, prices, and income, J. I. Falconer (pp. 95, 96).—The table previously noted (E. S. R., 63, p. 83) is brought down through February, 1930.

Agricultural economics investigations in Scotland, J. S. King (*Jour. Farm Econ., 12 (1930), No. 2, pp. 258–269*).—"A brief account is offered of the principles on which investigations of the economic position of the farming industry in Scotland are based, and of the methods employed."

The organization and development of agricultural economics in Russia, A. Tchayanov (*Jour. Farm Econ., 12 (1930), No. 2, pp. 270–277*).—The development and present organization of farm management investigations in Russia are described.

Recent economic changes in the United States, I, II, H. Hoover et al. (*New York and London: McGraw-Hill Book Co., 1929, vols. 1, pp. XXXVI+424, figs. 41; 2, pp. [2]+425–950, pl. 1, figs. 87*).—This is the report of a survey begun in January, 1928, and completed in February, 1929, by the Committee on Recent Economic Changes of the President's Conference on Unemployment of 1921, and includes the following reports of a special staff of the National Bureau of Economic Research, Inc.:

Vol. 1.—Introduction, by E. F. Gay (pp. 1–12); Consumption and the Standard of Living, by L. Wolman (pp. 13–78); Industry: Part 1, Changes in New and Old Industries, by D. S. Kimball (pp. 79–95), Part 2, Technical Changes in Manufacturing Industries, by L. P. Alford (pp. 96–166), and Part 3, The Changing Structure of Industry, by W. L. Thorp (pp. 167–218); Construction, by J. M. Gries (pp. 219–254); Transportation: Part 1, Railways, by W. J. Cunningham (pp. 255–308), and Part 2, Shipping, by E. S. Gregg (pp. 309–319); and Marketing, by M. T. Copeland (pp. 321–424).

Vol. 2.—Labor, by L. Wolman (pp. 425–493); Management, by H. S. Dennison (pp. 495–546); Agriculture, by E. G. Nourse (pp. 547–602); Price Movements and Related Industrial Changes, by F. C. Mills (pp. 603–655); Money and Credit and Their Effect on Business, by O. M. W. Sprague and W. R. Burgess (pp. 657–707); Foreign Markets and Foreign Credits, by J. H. Rogers (pp. 709–756); The National Income and Its Distribution, by M. A. Copeland (pp. 757–839); and A Review, by W. C. Mitchell (pp. 841–910).

An audit of America, E. E. Hunt (*New York and London: McGraw-Hill Book Co., 1930, pp. XII+203*).—A summary of Recent Economic Changes in the United States noted above.

Conservation of our natural resources, [C. R.] Van Hise, rev. by L. Havemeyer et al. (*New York: Macmillan Co., 1930, pp. XVII+551, pls. 3, figs. [96]*).—This volume is a revision of the volume previously noted (E. S. R., 24, p. 290), with sections as follows: Introduction, by L. Havemeyer (pp. 1–14); The Mineral Resources, by G. A. Roush (pp. 15–112); Water, by F. H. Newell (pp. 113–223); Forests, by H. S. Graves (pp. 225–316); The Land, by G. S. Wehrwein (pp. 317–389); Wild Life, by P. G. Redington and E. Higgins (pp. 391–505); and Conservation and Mankind, by L. Havemeyer (pp. 507–527).

Agriculture, edited by V. Brdlík (*Agriculture. Paris: Bossard; Prague: Orbis, 1928, pp. XLVII+881, pls. 33, figs. 203*).—This is the third volume of the encyclopedia dealing with the economic, social, and intellectual life of Czechoslovakia, published by the Ministry of Foreign Affairs of that country. The following articles are included: The State of Production, Organization, and Results of Agriculture, by V. Brdlík (pp. 1–91); Natural Conditions of Production, by J. Kopecký and J. Spirhanzl (pp. 92–104); Improvements of Land, by J. Horák (pp. 105–160); Culture, by A. Matoušek (pp. 161–272); Orchard Culture and Viticulture, by H. Fořt (pp. 273–301); Prairies and Pastures, by O. Horák (pp. 302–317); Plant Diseases and the Phytopathological Service, by F. Straňák (pp. 318–326); Seed Regulations, by A. Konečný (pp. 327–357); Agricultural Research, by J. Jelinek (pp. 358–384); The Institute of Accounts and Rural Economics, by F. Buček (pp. 385–398); Animal Production, by F. Bílek and J. Tupý (pp. 399–455); Horse Breeding, by F. Bílek (pp. 456–

493); Pisciculture, by V. Šusta (pp. 494–509); Bee Culture, by A. Schönfeld (pp. 510–513); Silk Culture, by A. Schönfeld (pp. 514–516); Agricultural Industries, by V. Vilikovský (pp. 517-566); The Dairy Industry, by O. Laxa (pp. 567–598); Rural Buildings, by T. Petřík (pp. 599–608); Agricultural Cooperation, by L. F. Dvořák (pp. 609–671); Agricultural Associations, by A. Prokůpek (pp. 672–680); Agriculture and Public Policies, by F. Kubec (pp. 681–814); Land Reforms, by C. Viškovský and A. Pavel (pp. 815–846); History of Czechoslovakian Agriculture, by J. Kazimour (pp. 847–862); Women in Czechoslovakian Agriculture, by M. Tumlířová (pp. 863–874); and Rural and Intellectual Life, by A. Matula (pp. 875–881).

Some observations on the agricultural situation in Hawaii, D. L. Crawford (*Hawaii Univ., Occas. Papers No. 8 (1930), pp. 35*).—The present conditions as to production, marketing, exports, imports, etc., are described; the needs are discussed; and suggestions are made for improving the present conditions.

[Cost of production studies of the New Jersey Stations, 1928–29] A. G. Waller (*New Jersey Stas., Rpt. 1929, pp. 10–14, 83–93*).—Tables are included summarizing the cost of production data obtained in the poultry survey of 43 Ocean County farms, the fruit and vegetable survey of 57 Burlington County farms, the market garden survey of 47 farms in Passaic, Bergen, and Essex Counties, and other surveys as follows: Potatoes, 42 farms; sweet corn, 40 farms; market tomatoes, 25 farms in Monmouth and Middlesex Counties; 18 300-bu. club potato growers' farms; and strawberries, 100 farms in south Jersey.

The economic survey [of Bayfield County, Wis.], G. S. Wehrwein and G. A. Peterson (*Wis. Dept. Agr. and Markets Bul. 100 (1929), pp. 69–93, pl. 1*).—This part of the bulletin, Land Economic Inventory of Northern Wisconsin, Bayfield County, prepared by the Wisconsin Department of Agriculture and Markets in cooperation with the Geological and Natural History Survey and the Conservation Commission, presents data showing the ownership and utilization of the lands of the county and the relationship of tax delinquency to ownership and utilization. A section of the bulletin dealing with land cover has been previously noted (E. S. R., 62, p. 532).

Piedmont farm business studies, W. C. Jensen and B. A. Russell (*South Carolina Sta. Bul. 264 (1930), pp. 42, figs. 22*).—This is a "follow up" of the studies previously noted (E. S. R., 56, p. 286) and is based on detailed reports kept by 8 farmers in the Central community and 12 farmers in the Easley community in 1927 and 12 and 25 farmers, respectively, in 1928. Tables and charts are included and discussed, showing for the 18 best and 16 poorest farms in 1928, for the 9 best and 9 poorest farms in 1927, and for the 27 best and 25 poorest farms for the two years the average capital utilized, land utilization, acreage in different crops, livestock of different kinds and poultry, expenses, receipts, earnings, costs of production by items of the principal crops, etc.

Some possibilities for increasing earnings are discussed.

Cost of producing farm crops in eastern Canada, E. S. Hopkins, A. Gosselin, and J. M. Armstrong (*Canada Dept. Agr. Bul. 115, n. ser. (1929), pp. 48, figs. 16*).—Tables are given and discussed showing the average cost of production, by items, of various crops on the Dominion Experimental Farms in eastern Canada during the period 1922–1926. Other tables summarize other data obtained from replies by farmers to questionnaires as follows: Average life of different farm machines and annual cost of farm machinery based on approximately 1,300 replies from 5 eastern provinces; cost of operating and advantages of tractors based on 179 replies from eastern Canada and British Columbia; and normal day of farm work in different operations based on about 610 replies from eastern Canada.

The work efficiency of farm organisation in Wales, 1871–1921, A. W. Ashby and J. L. Davies (*Welsh Jour. Agr., 5* (*1929*), *pp. 50–67*).—Tables are given and analyzed showing, by ten year periods, 1871–1921, the acres of land and numbers of livestock per person engaged in agriculture in North Wales, South Wales, and Wales and Monmouth, and the number of persons and of livestock per 1,000 acres of cultivated land in Wales and Monmouth.

The estimated increases in efficiency, 1871–1921, were 35 to 38, 43 to 47, and 40 to 45 per cent, respectively. The units per person in 1871 and 1921 were for all crops 6.7 and 5.61 acres, pasture and hay 17.25 and 25.38 acres, horses 1.09 and 1.94, cattle 5.46 and 8.51, sheep 25.11 and 36.93, and pigs 2.03 and 2.29. The hours per unit were for all crops 146 and 103, pasture and hay 13 and 9, horses 140 and 105, cattle 106 and 78, sheep 4.5 and 3.5, and pigs 70 and 54; total hours allocated to crops and stock 2,198 and 1,927; hours allocated to general work, etc., 549 and 482; and hours per person per day 9.12 and 8, respectively.

Rent and stock carrying capacity of some Welsh farms, J. P. Howell and P. George (*Welsh Jour. Agr., 6* (*1930*), *pp. 20–42, figs. 2*).—A statistical study was made of the relation of actual rent, including land, house, and buildings, to stock-carrying capacity on 180 highland farms in 3 districts and 135 lowland farms in 4 districts. In general the lower rented lands showed relatively high stock-carrying capacity, and there was a tendency for the smaller holdings in the highland group to be highly rented in relation to stock-carrying capacity.

The coefficients of correlation between rent per acre and stock index were 0.773±0.02 for 169 highland farms and 0.391±0.049 for 134 lowland farms. A rise of one in stock index corresponded on an average to a rise of 0.055s. (1.3 cts.) per acre in rent for the highland farms and 0.024s. for the lowland farms.

Relation of land tenure to plantation organization, with developments since 1920, C. O. Brannen (*Thesis, Columbia Univ., New York; Fayetteville, Ark.:* [*Author*], *1928, pp. V+85, figs. 18*).—Part 1 (pp. 1–77) has been previously noted (E. S. R., 52, p. 293). Part 2 (pp. 78–84) discusses the developments since 1920.

An enquiry into present-day value of capital invested in South Australian wheat farming, and its influence upon current costs of production, A. J. Perkins (*Jour. Dept. Agr. So. Aust., 33* (*1930*), *No. 9, pp. 772–800, figs. 6*).—Data were collected from 82 horse-worked and 47 tractor-worked South Australian wheat farms by the district agricultural instructors. Tables are presented and discussed showing for all the farms, the horse-worked farms, the tractor farms, the farms grouped according to size, and the farms grouped by districts the average acreage included, cleared, arable, cultivated, under crop, and fallowed; capital invested, by items, in improvements, farm plant, and revenue-earning livestock; and the annual interest and depreciation charges, by items. Comparison is made with the averages for 1921–1929 for the Turretfield Demonstration Farm.

Considerations in evaluating Illinois farm lands (*Illinois Sta. Circ. 356* (*1930*), *pp. 109, pl. 1, figs. 19*).—The following papers delivered at the Bankers and Land Appraisers Short Course at the University of Illinois, November, 1929, are included: Origin, Development, and General Characteristics of Illinois Soils, by E. A. Norton (pp. 5–18); Physical Properties of Soils Important as Indicators of Agricultural Value, by R. S. Smith (pp. 19–26); Important Soil Types in Illinois, by R. S. Smith (pp. 27–41); Chemical Makeup of Soils as Related to Land Appraisal, by E. E. DeTurk (pp. 42–46); Management and Treatment of Soils as Related to Loan Value, by F. C. Bauer (pp. 47–54); My

Experience in Appraising Land, by D. H. Doane (pp. 55–66); Economic Conditions and Their Effects on Land Values, by L. J. Norton (pp. 67–80); Methods of Appraisal and Their Application to Farm Real Estate Values, by E. H. Wiecking (pp. 81–95); Farm Earnings and Land Values on Fifteen Hundred Illinois Farms, by H. C. M. Case (pp. 96–105); and Influence of the Farm Operator on Land Values as Shown by Three Years' Results on 175 Illinois Farms, by M. L. Mosher (pp. 106–109).

Assessment ratios of rural real estate in Oregon and Washington, D. Pingree and R. C. Hall (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 6 (1930), pp. [4]+34, figs. 4*).—This mimeographed progress report is based upon data for the years 1921–1928 collected in seven counties in Oregon and two counties in Washington. Tables and charts are given and discussed showing by counties for different types of land the number, area, assessed value, sale value, and ratio of assessment to sale value of properties; and by five groups according to consideration paid the assessed value, consideration, and ratio of assessment to consideration for different types of land in the several counties.

Principles of agricultural credit, V. P. Lee (*New York and London: McGraw-Hill Book Co., 1930, pp. VII+405, figs. 6*).—This textbook covers the origin of credit and factors affecting its flow, the various uses of credit in agriculture, the methods used by financial institutions in obtaining funds, the cost of credit obtained through commercial banks, and the relation of the Federal and State Governments to agricultural credit.

Willamette Valley wools in relation to local consumption, E. B. Mittelman (*Oregon Sta. Bul. 261 (1930), pp. 23, figs. 8*).—Tables and charts are included showing the production and consumption of fine, medium, and coarse wool in the United States and in the Willamette Valley, the prices of different kinds of wool in London, Boston, and the Willamette Valley, and the seasonal and cyclical variations in prices.

In 1921 fine wools constituted 26.7 per cent of the consumption of wool by mills in the Willamette Valley, medium wools 51.9 per cent, and coarse wools 21.4 per cent. In 1927 the percentages were 33.3, 49.8, and 16.9, respectively. The percentages of production in the valley were, respectively, 12.9, 34.7, and 52.2 in 1921 and 14.8, 59.2, and 25.9 in 1927.

The contractility of wheat acreage in the United States, A. E. Taylor et al. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 6 (1930), No. 4, pp. [1]+151–187, figs. 3*).—This report, largely descriptive, indicates a general appraisal of the circumstances of wheat growing and determining wheat acreages in the different wheat-producing regions of the United States and the commercial incentives that have influenced the fixing of their wheat acreages by individual growers.

Economic trends of the vegetable industry, R. B. Donaldson and D. M. James (*Penn. Dept. Agr. Bul. 483 (1929), pp. 15, figs. 7*).—Tables and charts are included showing for the period 1918–1928 the car-lot receipts, shipments, and production of different vegetables in Pennsylvania, and the trends of car-lot receipts and of truck crops for sale and for canning.

Report of the fact finding survey of the Porto Rican citrus and pineapple distribution, F. App (*San Juan: Fruit Growers Impr. Com. Porto Rico, 1930, pp. VII+38*).—The survey reported on was made during the autumn of 1929 and spring of 1930 under the auspices of the Fruit Growers Improvement Committee of Porto Rico.

Fruit markets in eastern Asia, B. H. Crocheron and W. J. Norton (*California Sta. Bul. 493 (1930), pp. 366, figs. 81*).—This study was conducted in cooperation with the U. S. Department of Commerce. The report is based chiefly upon data gathered by the investigators on an eight months' trip to Japan, Chosen (Korea), China, the Philippine Islands, French Indo-China, Siam, British Malaya, the Netherlands (Dutch) East Indies, India, and Ceylon, during which 37 cities were visited and 28 conferences held with importers and dealers. Fruit in the diet, importations, home production, trade promotion methods, etc., of the several countries as regards fresh, canned, and dried fruits are discussed. The following conclusions are made regarding the Asiatic trade in California fruits:

The active demand for American fruit is already supplied. Present exports to Asia have no material effect on prices to California farmers. Several hundred per cent increase would be necessary to cause a perceptible increase in prices. An increased demand sufficient to increase prices must come from Asiatics rather than from Europeans in Asia. Fresh fruit sales can not be increased sufficiently to increase prices. Small packages of canned and dried fruits present the best opportunity for increased exports to Asia. The present system of collecting indent orders through agents will not develop a large market. Skillful extensive and sustained trade promotion would increase exports of certain fruits to the Far East several fold. Lower retail prices would increase markets. Extensive trade promotion may assist in sustaining prices of California fruits in future years, but can not materially help during the present price depression in California.

The oriental markets for California fresh fruits and vegetables, C. Spurlock (*Calif. Dept. Agr., Mo. Bul., 19* (*1930*), *No. 3–4, Sup., pp. 55, pl. 1, figs. 10*).—This is a report to the Solano County Board of Supervisors of the observations made by the author while on a voyage from September 13, 1929, to January 22, 1930, on a fruit cargo vessel, during which 11 ports and many inland cities were visited in 6 oriental countries.

Markets and fairs in England and Wales.—Part IV, Eastern and southern markets. Part V, Welsh markets. Part VI, London markets. Part VII, Final review ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 23* (*1929*), *pp. 221*, [*pls. 18*], *figs.* [*4*]; *26* (*1930*), *pp. 200*, [*pls. 17*], *figs.* [2]).—These numbers complete the series previously noted (E. S. R., 60, p. 386). Parts 4 and 5 summarize for the respective sections the markets as a whole, analyze the market situation by counties, and describe markets of general or special interest. Part 6 describes and discusses the London markets as a whole and the markets and exchanges for specific products. Part 7 reviews the introductory report (E. S. R., 57, p. 885) and discusses market rights and control, market charges, wholesale produce and livestock markets, and public abattoirs.

Prices of farm products graphically presented (*U. S. Dept. Agr. Yearbook 1930, pp. 572–591, figs. 35*).—Included are charts showing (1) the monthly prices, January, 1910, to December, 1929, of the principal agricultural products of the United States compared with index numbers of the prices farmers pay for commodities purchased; (2) the cycles in the prices of heavy hogs and beef steers at Chicago, 1890–1929, wool at Boston, 1900–1929, lambs at Chicago, 1901–1929, and butter at New York, 1890–1929; and (3) the relation between total production and the United States farm prices of apples, 1919–1928, and potatoes, 1920–1928; the relation between price and total live weight of slaughter under Federal inspection of hogs, 1922–23 to 1927–28, beef cattle, 1922–1928, and sheep, 1922–1928; and the relationship between world supplies of American cotton and New Orleans yearly prices, 1920–21 to 1927–28.

[Yearbook statistics] (*U. S. Dept. Agr. Yearbook 1930, pp. 592–1059*).—Current statistics and summaries for 1929 as noted for 1928 (E. S. R., 61, p. 487) are included.

Foreign trade of the United States, annual, 1790–1929: Honey and beeswax, C. G. GRIES (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Sect. Rpt. 50 (1930), pp. 17*).—A series of mimeographed tables are given showing quantity and value of the annual exports, imports, reexports, and net balance for honey, 1855–1929, and for beeswax, 1790–1929, and the shipments to and from the United States from and to Alaska, Hawaii, and Porto Rico of honey, 1903–1929, and beeswax, 1905–1929.

International yearbook of agricultural legislation [trans. title] (*Inst. Internatl. Agr. [Rome], Ann. Internatl. Lég. Agr., 18 (1928), pp. LXXXIII+900*).—This volume continues the series previously noted (E. S. R., 61, p. 289).

Commercial irrigation companies, W. A. HUTCHINS (*U. S. Dept. Agr., Tech., Bul. 177 (1930), pp. 40*).—This report is based on data from 40 projects. The present usefulness of commercial companies, kinds, internal features of such companies, the reasons for the general unprofitableness of such investments, and the public regulation of irrigation utilities are discussed.

Rural municipalities, T. B. MANNY (*New York and London: Century Co., 1930, pp. XVII+343, figs. 14*).—This is "a sociological study of local government in the United States." Part 1 (pp. 3–102) describes the development of local government in the United States and some of the existing opportunities for rural development. Part 2 (pp. 105–153) presents the results of a questionnaire survey of local rural government made by the author on a joint research project of the Bureau of Agricultural Economics, U. S. D. A., and the department of rural life, Hendrix-Henderson College. It is based upon replies from 156 farmers, 324 local government officials, and 33 college and university teachers of political science and rural sociology. Part 3 (pp. 157–264) sets forth definite proposals for the complete reorganization of local government in rural areas, and part 4 (pp. 267–333) contains a suggested rural municipality incorporation law, the declaration of purposes and constitution of Plainsboro Township, N. J., the questionnaire used in the survey, and a bibliography.

Rural buildings for business and social uses, W. C. NASON (*U. S. Dept. Agr., Farmers' Bul. 1622 (1930), pp. II+38, figs. 21*).—Examples of rural cooperative buildings for farm economics and home economics are described. The publication supersedes those previously noted (E. S. R., 45, p. 394; 47, p. 896).

The rural community club in Montana, J. W. BARGER (*Montana Sta. Bul. 224 (1930), pp. 52, figs. 10*).—This study, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, is based on fairly complete data secured from 56 active clubs and 12 inactive clubs by a questionnaire and personal visits. The organization, reorganization, objectives, constitutions, memberships, meetings, activities, and functions of rural community clubs and of typical clubs are described.

FOODS—HUMAN NUTRITION

Home canning of meat under conditions in Louisiana, G. SUNDERLIN (*Louisiana Stas. [Bien.] Rpt. 1928–29, p. 46*).—This is a progress report of a comparison of the keeping qualities of meats canned in the home in glass jars and in tin cans, canned meats stored in a warm room and in a basement, and meats processed under 15 lbs. pressure for 45 and for 60 minutes with those processed in the boiling water bath for 3 and 4 hours. Beef and pork from animals that had been killed less than 24 hours were canned in No. 2 tin cans with composition gaskets and in pint glass mason jars with new rubber rings and zinc caps. The cans and jars were stored from 7 to 8 months, including the summer months. At the end of this time no spoilage attributable to underprocessing was detected in any of the jars or cans. There were no leaks in the glass jars and no signs of deterioration of rubber rings, but some of the tin cans which had been stored in the basement and some which had been held for the longest processing period showed leaks apparently due to pin hole perforations from rust. It is planned to repeat the experiment, using paper instead of composition gaskets in the tin cans and using a drier basement for the cool storage.

"Although the meat processed in the boiling water bath showed no spoilage which was due to underprocessing, we do not at the present time recommend this method for use in Louisiana due to the possibility of botulism poisoning."

Effect of variation in ingredients on color of chocolate cake, E. Grewe (*Cereal Chem., 7 (1930), No. 1, pp. 59–66, figs. 2*).—Eight series of baking tests of chocolate cake were made, using a basic formula in which one variable at a time was changed and testing the resulting product for color by the Munsell system as described by Nickerson (E. S. R., 62, p. 503) and for H-ion concentration by the ball quinhydrone method as described by Whittier and Grewe (E. S. R., 61, p. 807).

Of the various factors studied, variations in the quantity of the salt, baking powder, and milk solids and in the color of the egg yolk were found to be of minor importance in their effect upon color. The brand and quantity of the chocolate or cocoa affected the shade of the cake. The most important factor was the H-ion concentration, as shown by decided differences in color with sweet milk and strongly acid milk and with varying amounts of sodium bicarbonate. The color constituent of the chocolate appeared to have the properties of an indicator, being yellow at pH 5 and changing to red at pH 7.5. Sufficient sodium bicarbonate to result in an H-ion concentration of pH 8 produced a rich mahogany color without detrimental effects on flavor.

The nutritive value of cereal breakfast foods.—III, The rate of digestion and absorption as determined by experiments on rats, H. A. Mattill and H. G. Smith (*Jour. Nutrition, 2 (1930), No. 3, pp. 217–224, figs. 8*).—In continuation of the investigation noted previously (E. S. R., 62, p. 891), the rate of digestion and absorption by rats of Wheat Endosperm, "Whole Wheat," and Precooked Oats was tested by determining the amount of starch left in the stomach and small intestines after varying intervals following the feeding of definite amounts of the cereals cooked uniformly for 15 minutes. Five or six comparable rats were fed each cereal and sacrificed at varying times. Two limitations in the method are pointed out, one being the variations in the motility of the alimentary tract and in the time taken by different animals to consume the meal and the other the questionable validity of the figures for reducing sugars as an index of the amount of starch and cereal involved. In order to assure uniform samples for analysis of the Precooked Oats, it was considered necessary to grind the material finely before cooking. For this reason samples of the other materials were similarly treated.

The finely ground samples of all the cereals left the stomach more rapidly than the coarser samples, and in this condition bran as present in the "Whole Wheat" and Precooked Oats had no effect in retarding the rate of stomach emptying, but showed rather a tendency to hasten it. This is thought to indicate that physical consistency rather than the presence of roughage determines the time of sojourn of cereals in the stomach. A slightly longer time was required for absorption from the intestines of the whole oats, but this was considered to be of small consequence.

Basal metabolism in orientals, H. Necheles (*Amer. Jour. Physiol., 91 (1930), No. 2, pp. 661–663*).—A possible explanation of the low basal metabolism of Chinese, as noted in the reports of metabolism studies conducted by the Chinese Physiological Society (E. S. R., 60, p. 893), is suggested by data on the basal metabolism of 8 orientals and 3 westerners during sleep and when awake. Six of the orientals with a low basal metabolic rate when awake showed no appreciable drop in metabolism during sleep, while 2 orientals with normal or high basal metabolism and 3 westerners with normal metabolism showed a drop in the basal metabolic rate during sleep. These results are thought to suggest the possibility that the lower basal metabolic rate of orientals is partly due to a greater degree of constant relaxation.

Diet and the teeth: An experimental study.—Part I, Dental structure in dogs, M. Mellanby ([*Gt. Brit.*] *Med. Research Council, Spec. Rpt. Ser. No. 140 (1929), pp. 308, pls. 109, figs. 55*).—This complete report of the author's studies of the relation of diet to the structure of the teeth and jaws in dogs (E. S. R., 60, p. 593) is the first of a series of three reports on an extensive investigation of the relation of diet to teeth, covering a period of 11 years.

The first five chapters of the present report deal with the experimental methods used throughout the investigation and with the normal and defective processes of dentition in dogs. In the next five chapters are presented in historical sequence the various studies leading to the differentiation of vitamin D from vitamin A on the basis of the control of calcification of the teeth. Chapters 11 and 12 deal with the theory of the author and E. Mellanby of the presence of an anticalcifying factor in cereals, and chapters 13 to 16, inclusive, with the effect of various factors on tooth development. The final chapter summarizes the investigation as a whole.

In the opinion of the author, the development of perfect teeth can be assured by an adequate supply of vitamin D either as found in natural foods or as artificially produced by irradiation. An increase in the cereal intake, combined with a deficiency in vitamin D, is considered to have a deleterious effect upon calcification entirely apart from its effect on the rate of growth. Cereals differ in their anticalcifying effect on the teeth, oatmeal being considered to have the greatest effect, followed in decreasing order by corn, barley, rye, whole wheat flour, rice, and white flour. The anticalcifying action is thought to be due to a specific substance which is destroyed by boiling with dilute hydrochloric acid and to a less extent by boiling with alkali. Vtamin D is thought to rank first in importance in calcifying processes, and perfect calcification is considered impossible without vitamin D however much calcium and phosphorus are in the diet.

"If the experiments described have any significance for the human subject, it would seem likely that the ordinary diet, especially of the poorer classes, in this country will tend to produce imperfect teeth, since vitamin D is either absent from or deficient in such articles of diet as bread, rice, oatmeal, barley, sugar, fruits, jam, most vegetables, lean meat of various descriptions, white fish, etc., which form the bulk of the food eaten."

The monograph contains numerous references to the literature and 109 photographic illustrations, including many photomicrographs of tooth sections.

Etiology of dental caries (*Brit. Med. Jour., No. 3606 (1930), pp. 292, 293*).—A brief review of the monograph noted above.

Effect of the luxus consumption of meat upon the kidney of the albino rat, R. A. Moore and F. A. Hitchcock (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 7, pp. 706–708*).—Blood pressure determinations and autopsy findings concerning the weight and histological changes in the kidneys of some of the rats in the previously noted investigation of the effects of a high protein meat diet (E. S. R., 56, p. 590) are reported, with the conclusion that "in the albino rat a high protein (meat) diet produces (1) no change in systolic blood pressure; (2) a hypertrophy of the renal substance; and (3) certain histological changes of a pathological nature which are not, however, analogous to chronic nephritis in man."

The emptying mechanism of the stomach, J. R. Murlin (*Jour. Nutrition, 2 (1930), No. 3, pp. 311–324*).—This is a critical review of the various theories concerning the control of the emptying of the stomach which have been proposed from that of Beaumont in 1825 to the present theory of hormone control. An extensive bibliography is appended.

The cause of the laxative action of bran, M. Falcon-Lesses (*Jour. Nutrition, 2 (1930), No. 3, pp. 295–310, figs. 2*).—In this investigation, rats in specially constructed metabolism cages were fed two basic diets, in one of which casein was used as the protein and in the other dried beef powder. Both diets were fed alone until the stool production had been determined, and then supplemented by unwashed bran, phytin-free bran, bran fiber, bran ash, and phytin, respectively, in varying amounts. Three criteria of laxative effect were considered, the daily number of stools, the dry weight of each stool, and the total dry weight of the stools produced daily.

Increasing amounts of bran were found to produce increasing weights of feces. The phytin-free bran proved as laxative as the unwashed bran. The ash and the phytin were not laxative in the quantities present in the bran, although bran ash fed separately in high concentrations was slightly laxative. It was concluded that bran owes its laxative action to its content of crude fiber and pentosans.

Continuation and extension of work on vegetable proteins, L. B. Mendel and H. B. Vickery (*Carnegie Inst. Wash. Yearbook 28 (1928–29), pp. 367–377*).—This is the customary annual report (E. S. R., 61, p. 291).

Progress in the studies on the relation of growth to diet have included a special study of water cress (*Nasturtium officinale*) as a growth stimulant. The small leaves of this plant were found to contain on the average 8.53 per cent of dry substance. Of this 13.7 per cent was inorganic material and 5.9 per cent an ether-soluble material of fatlike character. On diets consisting of casein 35, salt mixture 4, butterfat 9, lard 15, and starch 37 per cent supplemented with 0.4 gm. of dried liver and 0.4 gm. of dried water cress (equivalent to 4 gm. of fresh leaves) daily, male rats of 60 gm. initial body weight tripled their weight at the rate of 3-gm. gains per day in contrast to the "average" daily gains of 1.77 gm. To accomplish the same results somewhat larger quantities of lettuce were required.

Studies of the vitamin content of water cress confirmed the claim of Coward and Eggleton[1] concerning its richness in vitamin A. Ophthalmia in rats on an A-deficient diet was often, though not invariably, cured by the administration of 10 mg. daily of the dried leaves, equivalent to about 100 mg. of fresh leaves. Growth was not always resumed at a satisfactory rate on daily doses of from 5 to 50 mg. but invariably on 100 mg.

A daily dose of 400 mg. of the dried leaves proved sufficient as the sole source of the vitamin B complex for rats up to 120 gm. body weight. Later stages of growth, up to 350 gm. in male rats, could often be accomplished at a satisfactory rate on daily allowances of 700 mg. of the dried leaves and still better growth on an allowance of 1 gm. daily. In this respect also the water cress was more effective than lettuce.

Some doubt was cast on the current impression that a deficiency in vitamin A in the diet tends to reduce the resistance of the body to infections by a comparison of the incidence of lung infection in two groups of rats from 37 to 83 days of age kept for 75 days on otherwise adequate diets varying only in the amount of vitamin A, one lot receiving from 1 to 1.5 per cent and the other 9 per cent of butterfat. Growth was less satisfactory on the ration containing the smaller amount of butter and at autopsy these animals showed evidence of pus at the base of the tongue and renal calculi, but no evidence of lung infection.

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[1] Lancet [London], 1928, I, No. 2, pp. 97, 98, fig. 1.

The report also contains brief accounts of investigations noted from other sources, including attempts to secure refection in rats (E. S. R., 61, p. 594) and further studies by Mason on the relation of diet to fertility (E. S. R., 62, p. 194).

Chemical studies included in the report (pp. 372–375) are noted on page 308.

The paired-feeding method in nutrition experiments and its application to the problem of cystine deficiencies in food proteins, H. H. MITCHELL and J. R. BEADLES (*Jour. Nutrition, 2 (1930), No. 3, pp. 225–243*).—Illustrations of the use of the paired-feeding method in nutrition research are given from reports by Armsby (E. S. R., 46, p. 764), by Gulick, by Drummond and Marrian (E. S. R., 56, p. 694), by Kon and Drummond (E. S. R., 58, p. 193), and by Stucky and Rose (E. S. R., 63, p. 93), and the application of the method to the problem of cystine deficiences is reported. The data led to the conclusion that the proteins of lean beef and of white bread are not deficient, but that those of navy beans, potatoes, milk, and garden peas are deficient in cystine for supplying the growth requirements of the rat. The addition of cystine to the garden pea ration did not modify the completeness of digestion of the nitrogenous compounds contained in it.

Do the spectrograms of Kahlenberg and Closs demonstrate the presence of aluminum in biological matter? E. V. MCCOLLUM, O. S. RASK, and J. E. BECKER (*Jour. Biol. Chem., 85 (1930), No. 3, pp. 779–781*).—In this reply to the paper of Kahlenberg and Closs (E. S. R., 62, p. 190), the authors express their belief that the spectrograms published in their paper do not show the presence of aluminum.

Presence of aluminum in animal and plant matter, L. KAHLENBERG and J. O. CLOSS (*Jour. Biol. Chem., 85 (1930), No. 3, pp. 783, 784*).—A reply to the communication noted above.

The relation of the fat-soluble vitamins (A and D) to the development of experimental rickets in rabbits, A. R. MORITZ and C. KRENZ (*Jour. Nutrition, 2 (1930), No. 3, pp. 257–264, fig. 1*).—Supplementing previous studies by Goldblatt and Moritz (E. S. R., 54, p. 595), in which rickets was produced in rabbits by a diet deficient in fat-soluble vitamins (A and D), low in phosphorus, and high in calcium, the authors have tested the effect of a diet deficient only in fat-soluble vitamins. On such a diet rabbits showed no rickets at the end of from 14 to 45 days, but almost uniform lowering of the blood serum calcium and of the calcium in the whole bones. In three rats which were fed the same diet the amount of calcium in the bones was unquestionably reduced, and rickets occurred in one of the animals.

Recent work on vitamin A (*Nature [London], 125 (1930), No. 3150, pp. 428–430*).—A brief review of recent literature on the assay, chemistry, and physiology of vitamin A.

Vitamin A and carotin [trans. title], N. BEZSSONOFF (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 8, pp. 529–532, fig. 1*).—An extract prepared from fresh carrot juice by mixing with a neutral solution of lead acetate, extracting the dried precipitate with petroleum ether or benzine, evaporating the solvent, and dissolving the residue in peanut oil was found to have a greater vitamin A activity in rat tests in doses of 0.025 and 0.05 mg. daily than 9 or 18 mg., respectively, of cod-liver oil.

These results, together with the contradictory results reported in the literature for vitamin A activity of various carotin preparations, indicate, in the opinion of the author, not that vitamin A and carotin are identical but that carotin exerts a selective absorption for vitamin A with possible molecular combination between the two.

Studies in the physiology of vitamins, VIII–XII (*Amer. Jour. Physiol., 91 (1930), No. 2, pp. 513–562, figs. 13*).—Continuing the series previously noted (E. S. R., 63, p. 93), five papers are presented.

VIII. *The effect of parathormone on normal and vitamin B-deficient rats*, W. B. Rose and C. J. Stucky (pp. 513–519).—A certain similarity between the symptoms of parathyroid tetany and vitamin B deficiency in dogs led to this study in which parathormone, a potent extract of the parathyroid glands, was first tested as a possible source of vitamin B for rats. Not only did the extract show no evidence of containing vitamin B, but it proved toxic for the B-deficient rats. This led to the second part of the study in which the effect of the hormone was tested on normal rats of different ages. Although young animals appeared to be more resistant than older ones, the extract proved definitely harmful, with fatal results after repeated injections. Successive injections of the material produced a significant increase in blood serum calcium.

IX. *Homoglobin, sugar, and chloride changes in the blood of vitamin B-deficient rats*, W. B. Rose, C. J. Stucky, and L. B. Mendel (pp. 520–530).—This study followed the same general plan as that of the second series of studies with dogs, noted in the seventh paper. Similar results were obtained. Evidence of anhydremia was secured, together with slight hypoglycemia followed by moderate hyperglycemia and a decrease in blood chlorides in the control rats receiving the same amount of food and water, as well as in the test animals.

X. *Further contributions to the study of gastric motility in vitamin B deficiency*, W. B. Rose, C. J. Stucky, and G. R. Cowgill (pp. 531–546).—A more carefully controlled study of hunger contractions in dogs on vitamin B-deficient diets (E. S. R., 61, p. 193) is reported in which nonfistula dogs were used, parallel blood studies were made from time to time to control possible complications, and, as in the more recent studies in the series, a group of controls was given the same amount of food and water that the corresponding B-deficient animals consumed in order to rule out the effects of inanition. A special technic was perfected by means of which records of hunger contractions could be made continuously for 24 to 36 hours. Special care was also observed to avoid taking records on animals showing any outward signs of vitamin B deficiency except loss in appetite and decrease in general activity.

Under these conditions, disturbances of gastric motility developed in all of the dogs suffering from vitamin B deficiency and also in varying degrees in the controls receiving the same amount of food and water but no vitamin B.

Complete gastric atony was observed in some but not all of the test animals, but in none of the controls. The atony occurred in some cases at least 10 days before nervous manifestations were apparent. Complete anorexia for the deficient food was not necessarily associated with gastric atony, and the desire for food did not appear to depend upon the vigor of the hunger contractions. General stasis was present in some of the B-deficient animals.

XI. *The effect of insulin on gastric atony in vitamin B deficiency*, W. B. Rose, C. J. Stucky, and G. R. Cowgill (pp. 547–553).—In this extension of the tests reported in the sixth paper of the series (E. S. R., 61, p. 193), the injection of insulin into two nonfistula dogs showing long maintained gastric atony as the result of a deficiency in vitamin B was without effect upon the gastric musculature. Both dogs rapidly regained gastric tonus, with vigorous hunger contractions, after the administration of vitamin B. The injection of insulin, while having no effect upon gastric motility, brought on symptoms of insulin overdosage which were relieved by injections of glucose and vitamin B therapy.

XII. *The effect of parathormone on gastric motility in vitamin B-deficient and normal dogs*, W. B. Rose, C. J. Stucky, and G. R. Cowgill (pp. 554–562).—

Injections of parathormone had no significant effect on gastric atony in three vitamin B-deficient dogs. Tracings of the motility of the stomach of four normal dogs were indistinguishable from similar tracings made after the injection of parathormone in amounts insufficient to produce marked hypercalcemia. In one animal a decrease in the motility of the stomach occurred during the latter half of a continuous 24-hour tracing at a time when the serum calcium had risen to over 50 per cent above the normal level.

Studies of vitamin C in fresh and canned tomatoes, B. Clow and A. L. Marlatt (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 8*, *pp. 767–775*, *figs. 12*).—This is the complete report, with experimental data and discussion of technic, of the investigation at the Wisconsin Experiment Station noted previously from progress reports (E. S. R., 61, p. 194).

The recovery type of experiment was used, the method consisting in feeding the guinea pigs a diet free from vitamin C until definite scurvy symptoms developed and then determining the minimum dosage of the materials to be tested essential for approximately complete recovery in 16 days. The recovery dosage of field-ripened raw tomatoes was estimated to be 3 gm. daily, and this was taken as the standard of comparison. In addition to the findings which have been noted from the progress reports, evidence is given of an appreciable destruction of vitamin C in field-ripened tomaotes canned by the open kettle method, and also that greenhouse tomatoes allowed to ripen on the vine are not quite so potent a source of vitamin C as field tomatoes ripened on the vine.

The relation of vitamin D to deposition of calcium in bone, H. C. Sherman and H. K. Stiebeling (*Soc. Expt. Biol. and Med. Proc.*, *27* (*1930*), *No. 7*, *pp. 663–665*).—In this preliminary report, the conclusion is drawn that under properly controlled conditions any one of the three factors phosphorus, calcium, or vitamin D may be the limiting factor in bone development. The experimental evidence on which this is based is essentially as follows:

When growing rats were fed a liberal allowance of vitamin D and a constant supply of phosphorus (0.42 per cent), the calcium content of the bodies at intervals during the period of growth was markedly influenced by the calcium content of the food as varied from 0.16 to 0.5 per cent of calcium in the dry food mixture.

On a basal diet containing a generous allowance of calcium and phosphorus in favorable proportions (calcium 0.74, phosphorus 0.58 per cent), but with no vitamin D beyond the body store at 21 to 28 days of age, the calcium content of the bodies at any given age was about the same as of similar animals receiving 0.32 per cent calcium and 0.42 per cent phosphorus, together with a liberal supply of vitamin D. The calcium content of the femurs of rats kept from the age of 21 or 28 days to the age of 56 days on the vitamin D-deficient diet of the authors (E. S. R., 62, p. 494) was about twice as high as that of similar rats fed the high calcium rickets-producing diet 2965 of Steenbock for the same length of time. Although the rats did not have rickets, as determined by the line test, the addition of vitamin D in the form of whole milk powder brought about increased calcification up to a certain maximum. This could be attributed to nothing but the vitamin D content of the milk.

These results are thought to confirm and extend the findings of Steenbock, Nelson, and Black (E. S. R., 52, p. 804) and of Soames and Leigh-Clare (E. S. R., 60, p. 95) that vitamin D may be the limiting factor when the mineral content of the diet is good, and of the later work of Steenbock and his associates, of Fairhall (E. S. R., 59, p. 597), and of Sherman and MacLeod (E. S. R., 54, p. 593) that vitamin D can not take the place of calcium for optimal bone development. The protection of rats on the Sherman-Pappenheimer high-calcium low-phosphorus diet by the simple addition of a phosphate is explained as due to the availability of the bodily store of vitamin D which the animals had previously acquired.

"Vitamin D appears to have influence upon the rate of normal calcification, even at levels well above those associated with rickets, but the supplying of vitamin D in abundance does not justify any lack of care in providing the growing organism with the liberal calcium intake which has also been shown to be essential to the optimal development of bone."

Vitamin studies.—XVII, Ossifying potency of raw and evaporated milks, H. E. Honeywell, R. A. Dutcher, and C. D. Dahle (*Jour. Nutrition, 2 (1930), No. 3, pp. 251–256*).—This is a continuation of the investigation at the Pennsylvania Experiment Station of the vitamin content of raw and evaporated milk (E. S. R., 58, p. 294). As in the earlier studies, the evaporated milk samples were prepared from the same supply as the raw milk fed. The prophylactic method was as follows:

Young rats at 21 days of age and weighing between 36 and 46 gm. were given the Steenbock yellow corn ration 2965 for 21 days, with the prescribed amount of milk in separate doses daily. At the end of the experimental period the animals were killed with ether, examined carefully for beading of the ribs, enlargement of the joints and softening of the bones, and the right humeri were preserved for the line test and the femurs for ash analyses according to the technic previously described (E. S. R., 55, p. 387). The raw milk was fed in 5-, 10-, 12-, 15-, and 20-cc. portions and the evaporated milk in 10-, 12-, and 15-cc. portions.

Doses below 12 cc. of the raw milk produced a bone ash below the average at the beginning of the experiment, and at 12 cc. slightly above this level but below the usual level on the laboratory stock diet. At the 10-cc. level slight seasonal variations were noted in the raw but not in the evaporated milk samples, and at the 12-cc. level in both. At the 10-cc. level marked differences in the percentages of bone ash between the raw and evaporated milks were apparent, the values reported being for raw milk 38.3, vacuum evaporated 33.4, vacuum evaporated sterilized 27.8, air evaporated 29.5, and air evaporated sterilized 25.5 per cent. The differences became less marked with increasing dosage.

Following the suggestion of Daniels and Loughlin (E. S. R., 44, p. 860) that some of the differences between evaporated and raw milk may be due to the mechanical removal of a portion of the salts during the evaporating process, samples of the different forms of milk were ashed and fed in comparison with the original samples. In all cases the milk ash had a lower ossifying potency than the corresponding milk, indicating that a part at least of the calcifying properties of the various milk samples must have been due to vitamin D.

"The data obtained indicate that the milks described are not rich in vitamin D. While commercial methods of evaporation and sterilization evidently affect the ossifying potency of milk to an appreciable degree, no attempt has been made to differentiate between mineral loss and vitamin D destruction."

The effect of vitamin D and of reaction of diet upon response to parathyroid extract, A. F. Morgan and E. A. Garrison (*Jour. Biol. Chem., 85 (1930), No. 3, pp. 687–711*).—Interest in the possible effect of parathyroid extract upon young animals deprived of vitamin D was aroused by the possibility that parathyroid abnormalities may play some rôle in the production of pyorrhea and other mouth diseases.

In the first series of experiments, dogs were placed at weaning on an artificial diet of relatively low phosphorus but normal calcium content. In the fourth month, after active rickets had developed in all of the animals except two controls receiving small doses of vitamin D, injections of parathyroid extract were begun, with and without other treatments consisting, respectively, of the addition of vitamin D in the form of cod-liver oil or irradiated ergosterol, of ammonium chloride to produce an acid urine, and of sodium carbonate to produce an alkaline urine.

There was little response to the parathyroid extract alone; serum calcium was raised only slightly, and clinical symptoms of overdosage were lacking. In the dogs receiving vitamin D there were abnormally large increases in serum calcium and phosphorus, followed by death with symptoms of overdosage. In the animals receiving sufficient sodium carbonate to make their urine alkaline, either with or without vitamin D, the administration of parathyroid extract was followed by abnormally high serum calcium and toxic symptoms, while similar treatment with ammonium chloride had very little effect.

It is emphasized that whatever the explanation of the effect of vitamin D and alkali treatment on the response to parathyroid treatment may be, this possibility of harmful effect should be kept in mind in parathyroid treatment for any purpose.

MISCELLANEOUS

Yearbook of Agriculture, 1930, A. M. Hyde et al. (*U. S. Dept. Agr. Yearbook 1930, pp. VI+1080, figs. 255*).—This contains the report of the Secretary of Agriculture, nearly 200 brief articles arranged alphabetically by subjects and discussing recent developments under the general title of What's New in Agriculture, a list classified by general subject matter of the Department publications of the calendar year 1929, a graphic presentation of the prices of farm products noted on page 388, and the usual statistics noted on page 388.

Report of the [Louisiana] Agricultural Experiment Stations for the years 1928–1929, C. T. Dowell et al. (*Louisiana Stas. [Bien.] Rpt. 1928–29, pp. 67*).—This contains the organization list, financial statements for the fiscal years ended June 30, 1928, and June 30, 1929, and a report by the director, including brief departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

Fiftieth Annual Report of the New Jersey State Agricultural Experiment Station and the Forty-second Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1929, J. G. Lipman et al. (*New Jersey Stas. Rpt. 1929, pp. XXIX+326, figs. 12*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1929, a report of the director on the work and publications of the year, and departmental reports, the experimental features of which not previously reported are for the most part abstracted elsewhere in this issue.

The Bimonthly Bulletin, Ohio Agricultural Experiment Station, [May–June, 1930] (*Ohio Sta. Bimo. Bul. 144 (1930), pp. 65–96, figs. 9*).—In addition to nine articles abstracted elsewhere in this issue, an illustrated obituary note is given on W. K. Greenbank (1869–1930), connected with the station for 18 years and its editor since 1922.

Abstracts of Bulletins 393–404 and Circulars 53–54, A. D. Jackson (*Texas Sta. Circ. 56 (1929), pp. 23*).—The publications abstracted have been previously noted. Abstracts of several articles appearing in scientific and popular journals are appended.

NOTES

Purdue University and Indiana Station.—Effective July 1, Miriam Rapp, research assistant in home economics, and Roy L. Neubrech, assistant in forestry, resigned, the latter to accept a position with the National Committee on Wood Utilization through the U. S. Department of Commerce. C. E. Skiver, a county agricultural agent in northern Michigan, has been appointed to take charge of wheat improvement work in southwestern Indiana financed in part by private funds and in part by the Southwestern Wheat Improvement Association. Other appointments include O. C. Lee as weed specialist and the following assistants: John S. James in soil survey work, R. B. Rankin in agronomy, Dr. Arthur L. Delez in animal pathology, and Edward T. Shaw in forestry.

Iowa College and Station.—A State park near Winterset, Madison County, was dedicated June 30 under the name of Pammel State Park, thereby honoring Dr. L. H. Pammel, long professor of botany in the college and at present chief botanist in the station.

Kentucky University and Station.—*Science* notes that A. J. Olney, who has been acting head of the department of horticulture, has been appointed in charge of the teaching of horticulture in the College of Agriculture and the station work in fruit and vegetable growing.

Michigan College.—A cooperative central laboratory for the culture and study of strains of Brucella as the cause of infectious abortion is to be maintained at the college. An allotment of $18,800 has been made by the National Research Council for a three-year program of study under the supervision of the joint committee of the divisions of medical science and biology and agriculture.

West Virginia University and Station.—An intensive study of the pasture problem is being undertaken in a five-year series of tests by the departments of agronomy and dairy husbandry under a cooperative arrangement with the U. S. D. A. Office of Forage Crops Investigations. The experiment will be made particularly with respect to the uses of different fertilizers and lime. Forty Ayrshire cows will be grazed on variously treated pastures on the Reymann Memorial Farms at the Wardensville Substation, and in addition there will be established small plats on six or seven soil types in several counties on permanent pasture land which will be treated with different fertilizers.

Varietal tests with tomatoes, eggplant, and peppers and a study of the value of paper as a mulch versus cultivation were begun last year at the agronomy substation at Lakin. This year the scope of the work is being widened to include cabbage and beans. The formation at Point Pleasant of the Ohio-Kanawha Valley Truckers' Cooperative Association is the outcome of a field survey in the two valleys to determine the most effective application of the act passed by the last legislature which authorized a truck-growing demonstration plant in a section of the State well adapted to vegetable crops.

A modern hospital barn, 50 by 26 ft., and containing 6 stalls and 6 pens has been erected on the station dairy farm at Morgantown for use in connection with a project on the control of abortion in dairy cattle, which is being conducted by the departments of dairy husbandry and veterinary science. An experimental building for the study of parasitic diseases of sheep and calves is under construction at the station livestock farm.

The 160-acre experimental farm at Kearneysville in the eastern panhandle region, acquired by the station some months ago and known as University Farm, is being developed mainly for orchard work with apples, with smaller plantings of peaches and sour cherries. A comparison of different rootstocks for apple trees will be made, the value of dwarfing and semidwarfing, as well as of uniform standard stocks, will be determined, and orchard fertilization and systems of cover cropping will receive attention. New varieties of fruits and of nut trees will be planted. Work in insect and disease control will include studies of the pistol-case bearer, fruit spot, collar blight, and root rot. Problems of soil improvement and of varieties and rotations in relation to grain farming will be studied, and attention will also be given to the production of hay and forage crops and to pasture improvement. A spray system with pipe lines leading into the orchard from a central plant will supply data on the cost and efficiency of the system.

D. R. Dodd, assistant agronomist, has resigned to become professor of soils extension at the Ohio State University. Recent appointments include the following: F. W. Craig of the State Department of Agriculture as assistant horticulturist to have charge of the experimental work with vegetables at the Lakin Substation; A. P. Dye, gardener at the university, as assistant in horticulture at the station and instructor in horticulture in the College of Agriculture; R. A. Ackerman, assistant in dairy husbandry, as assistant dairy husbandman at the Reymann Memorial Farms; Leif Verner, assistant professor of horticulture and assistant horticulturist at the Idaho University and Station, as assistant professor of horticulture, assistant horticulturist, and extension horticulturist; and G. Gordon Pohlman as assistant professor of agronomy and assistant agronomist.

Wisconsin University and Station.—A new wing to the present horticultural building and to be known as the agronomy unit, though also accommodating the department of plant pathology, has been authorized by the board of regents. The preliminary plans call for a three-story and basement building and additional greenhouse units at a total cost of $175,000.

Under an act of Congress approved April 15, 1930, the Secretary of Agriculture is empowered to accept from the regents of the university a tract of land suitable for a site for a building or buildings for the forest products laboratory. An appropriation of $900,000 is authorized for the construction and equipment of a fireproof building or buildings for the purpose.

A notable privately owned collection of bee books aggregating approximately 1,250 titles has just been purchased in England for the Miller Memorial Apiculture Library. Most of the titles represent bound books, many being over 300 years old and some having been printed as early as 1500 to 1550. While most of the books are in English, there are also a considerable number in German, French, and Italian, with a few in Dutch, Spanish, and Latin. It is thought that the addition of this collection will give the library first rank in this subject.

The fellowship funds of the university continue to be increased from a wide range of sources. Thus, a new industrial fellowship fund in agricultural bacteriology offered the university by the American Association of Medical Milk Commissions has been accepted, and will provide $2,100 for the purpose of studying the pathogenicity in monkeys and cattle of certain strains of hemolytic streptococci, particularly *Streptococcus epidemicus*, the organism responsible for septic sore throat in man. This study grew out of the research carried on under an industrial fellowship fund provided during the past four years by the Chicago Medical Milk Commission, one result of which is thought to have been the preservation of the Wisconsin certified milk industry. It is planned to study the effects caused by the artificial inoculation of monkeys and dairy cows with *S. epidemicus* and other hemolytic streptococci that are closely related, so as better to determine the relationship of these bacteria to common diseases of the cow, such as mastitis, and to learn if any other hemolytic streptococci except *S. epidemicus* are capable of causing pathological conditions in man.

The Superphosphate Institute, an organization made up of many producers of superphosphate, has offered the university an industrial fellowship fund to permit the making of a digest and bibliography of the world's scientific literature on the relation of phosphorus to soils, fertilizers, and plant growth. The belief is expressed that much duplication of effort now takes place in research due to a lack of knowledge regarding experimental results already secured in other experiment stations in the United States and abroad. It is hoped that the proposed digest and bibliography will render such duplication unnecessary and will also bring into sharp relief the problems that are most in need of study. For the present year the fund available for this work will amount to $5,000. Dr. Ernst Morgenroth of Berlin has been appointed industrial fellow to carry on the project.

The committee on sex research of the National Research Council has renewed for 1930–31 the research grant made during the past two years for the purpose of conducting research in avian spermatogenesis and associated problems of sex. This study is particularly concerned with the sex ratio of certain types of hybrid pigeons, and the cytological work is being carried out by Dr. T. S. Painter of the University of Texas. In addition to the continuation of this project the National Research Council has also provided funds for the salary of a research fellow to study the physiology of "pigeon's milk." The total financial support of the council to these two lines of work will be $1,500 for the present fiscal year.

Two other industrial fellowships include a grant of $3,500 by the American Can Company for sauerkraut research in the departments of agricultural chemistry and agricultural bacteriology and a two-year grant of $3,400 by the Agricultural and Scientific Bureau of the N. V. Potash Export My. of New York City for a second fellowship for potash studies. The new potash work is expected to include a comprehensive study of the forms of potash or the kinds of potash minerals that exist naturally in soils or are formed in soils through the addition of potash fertilizers, farm manures, and crop residues. An inquiry is also projected regarding the availability to the plant of the various potash minerals and to perfect if possible a chemical test for the determination of the readily available potash and thus of the potash needs of the soil. Norman J. Volk has been appointed industrial fellow under this fund.

Miscellaneous.—Dr. W. M. Jardine, Secretary of Agriculture from 1925 to 1929, was confirmed by the United States Senate on July 21 as Envoy Extraordinary and Minister Plenipotentiary to Egypt.

The honor of knighthood has been conferred by King George on Dr. G. A. K. Marshall, director of the Imperial Bureau of Entomology.

Announcement has been made that the Ninth International Dairy Congress will be held in Copenhagen, Denmark, in 1931.

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EXPERIMENT STATION RECORD

Vol. 63 October, 1930 No. 5

The United States Department of Agriculture, like most agencies of the Federal Government, is almost entirely dependent for its funds upon annual appropriations. The legislation by which most of these funds are provided is therefore of immediate importance to all who are directly associated with it, as well as of considerable general interest to many others. Because of this interest it has long been the custom in these columns to present an annual summary of the prospective fiscal situation and to indicate briefly the more significant changes in status or policy which its enactment seems likely to involve. A special justification for such a discussion lies in the complexity of the legislation and the numerous difficulties which are frequently encountered in making comparisons directly from the successive appropriation acts without more or less interpolation and interpretation

The latest of these measures, signed by President Hoover May 27, 1930, and covering the fiscal year ending June 30, 1931, conforms in a general way to the standardized arrangement of items and phraseology which is being evolved from year to year, but there are many deviations for which due allowance must be made. Considerable supplementary legislation carried in other acts must also be taken into account, and as usual the so-called "permanent, special, and indefinite appropriations," which accrue annually to the Department without reenactment, must be included if a recapitulation of the Department's full resources is attempted.

The appropriation act itself carries a total of $155,397,770, and the permanent appropriations aggregate $11,618,436. There are also supplementary items, however, carried in the First Deficiency Act of March 26, 1930, and the Second Deficiency Act of July 3, 1930, mainly to provide for activities authorized by legislation enacted subsequent to the act itself and by the reappropriation of certain unexpended balances and other allotments of indefinite amount from the previous year. If these indefinite factors are disregarded, the total is $175,618,112, an apparent decrease of $34,093,417 from the corresponding items similarly assembled for the previous year.

The situation as regards agriculture, however, is as usual greatly obscured by the large proportion of the Department's appropriation which is devoted to road construction and other activities not usually associated with agriculture or of an emergency type. For the fiscal year 1930 the roads funds total no less than $118,683,407, and for 1931, $90,111,628. These sums thus account for over 50 per cent of the Department's prospective budget.

For its remaining work the Department's allotment for 1931 is $85,506,484, a decrease of $5,521,638. This, however, is more than counterbalanced by the smaller appropriations for farmers' seed loans, preventing spread of the Mediterranean fruit fly, and fighting forest fires. Eliminating all such items from the comparison the appropriations for what may be termed the general activities of the Department are for 1930, $77,210,333 and for 1931, $83,466,484. This is a net increase for such activities of $6,256,151, or slightly over 8 per cent.

As a matter of fact the precise total cannot be computed with certainty at this time, but will be somewhat higher because of a number of indefinite commitments of the Government. Among these are the additional expenditures for salaries necessitated by the Brookhart-Lehlbach Act of July 3, 1930, which amended the Welch Act of May 28, 1928, in an effort to correct certain inequalities which developed under the latter legislation. This new law adds certain salary rates to many of the lower classification grades for employees in Washington, and provided an immediate automatic increase in pay of from $60 to $200 each in many cases both in Washington and the field service. As no funds were definitely allotted for these payments it is anticipated that their mandatory nature will necessitate in many cases deficiency appropriations later in the year.

An especially noteworthy aspect of the new appropriations is the estimated increase of over $1,600,000 for research. Among the larger projects of this nature are a new item of $100,000 for cotton ginning studies; $250,000 for forestry research, principally under the McNary-McSweeney Act; $350,000 for entomological research; and $205,000, $360,000, $216,000, and $120,000 for other investigations by the Bureaus of Animal Industry, Plant Industry, Chemistry and Soils, and Agricultural Economics, respectively. There are also included increases of $34,000 for the research projects of the Bureau of Dairy Industry; $66,000 for the Bureau of Biological Survey; $32,000 for agricultural engineering research; and $35,000 for the work of the Bureau of Home Economics.

Under a provision in the Second Deficiency Act the funds available for cooperative agricultural extension work are increased by $1,000,000. These funds are to be allotted by the Secretary of Agriculture to the States and the Territory of Hawaii, and must be matched by corresponding amounts from State, county, or local authorities, individuals, or organizations. There is also provided an increase of $10,000 for extending the Smith-Lever Act to Alaska, and $58,000 additional for the employment of extension specialists in agricultural economics and cooperative marketing. This will make the total from Federal funds for extension work for 1931, $10,427,936.

Still another significant increase is that of $100,000 in the Department's allotment for printing. This appropriation supplements a corresponding increase last year, and is expected to relieve considerably the serious congestion of material still awaiting publication, especially in the technical series.

Taking up the allotments to the individual bureaus and offices, the funds under the Office of Experiment Stations will aggregate $4,751,500. Of this amount, $4,340,000 represents the statutory payments to the States and Hawaii under the Hatch, Adams, and Purnell Acts. The Office itself receives $411,500, an increase of $9,500. Of this amount, $7,500 is to provide additional assistance in the administration of the station funds, $1,000 is for the Guam Station for extension work and station equipment, and $1,000 is for the equipment of the laboratory and travel expenses for the veterinarian-animal husbandman at the Virgin Islands Station.

The Weather Bureau receives an increase from $3,493,300 to $4,113,600, mainly to provide additional aerological observations for aviation purposes under the Air Commerce Act. There is, however, an increase of $10,000 for frost warnings in fruit-growing areas, $5,000 for an extension of the forest-fire weather warning service, and $5,300 for an extension of the corn and wheat weather service into the grain sections of Washington, Oregon, and Idaho. Jurisdiction over the former Weather Bureau property at Mount Weather, Va., transferred to the Division of Public Buildings and Grounds of the War Department in 1929 when it was expected that the property might be utilized as a "summer White House," was restored to the Department, together with the balance of the administrative appropriation, and authority was again granted for the sale of this tract if deemed desirable.

The total for the Bureau of Animal Industry is $15,726,935, a net increase of $620,300. The meat inspection will receive $5,640,000 and the tuberculosis campaign $6,190,000, the latter item having been reduced by $171,000 on account of an anticipated lessening of activities because of the progress made in eradication. Other increases include $34,000 for Federal cooperation in an enlarged program of cattle-tick eradication in Texas, Louisiana, and Arkansas, and $40,000 for beef-cattle studies in areas where the ticks have been eradicated; $55,700 for additional poultry research; and a number of smaller sums on both animal-production and animal-disease projects.

The Bureau of Dairy Industry receives $722,765, an increase from $688,265. This is divided among a number of items, including $7,600 for the expansion of dairy manufacturing investigations, $8,000 for the extension of the dairy herd improvement work to new sections, and $9,000 for a similar extension of dairy feeding and breeding experiments.

One project of special interest under this bureau carries an allotment of $10,000 for cooperation with the Missouri Experiment Station in the establishment and maintenance of dairy experimentation on the Hatch Memorial Experiment Farm at Hannibal, Missouri. This farm, it may be recalled, was the home of Colonel William H. Hatch, author of the act establishing the national system of experiment stations, and was bequeathed to the State of Missouri in 1923 by the only surviving member of his family for an agricultural experiment station or other agricultural use in order to perpetuate his name and memory. The bequest was accepted by the State, which placed the farm in charge of the Missouri Station, and ultimately made an appropriation of $10,000 toward its equipment and maintenance on condition that an equal sum be provided by the Federal Government. It is expected that the farm will thus perform the double function of a Federal and State memorial to Colonel Hatch and a cooperative dairy experimental station.

The new total for the Bureau of Plant Industry is $5,560,286, a net increase of $336,638, mostly for research distributed over 35 items. Thus for forest pathological work the increase is $19,948; for cotton production and diseases, $59,500; for cereal crops and diseases, $90,604; for tobacco diseases, $10,000; for accelerating sugarcane variety tests, $10,000; for dry-land and western irrigation agriculture, $35,000; for horticultural crops and diseases, $122,269; for the foreign plant introduction work, $11,300; for the extension of pasture experiments to New England, the Corn Belt, and the Northwest, $10,000; and for the study of acid tolerant leguminous crops in the Southeastern States, $20,000. On the other side of the ledger is a decrease of $20,000 in the funds for rubber investigations.

The Forest Service receives $29,776,730, of which $11,000,000 (an increase of $1,000,000) is for the construction of forest roads and trails, $2,000,000 for the acquisition of additional lands at the headwaters of navigable streams, and $1,700,000 (an increase of $300,000) for cooperative fire protection. Most of the increase is for administration and maintenance of the national forests, but for research the California Forest Experiment Station receives $30,000 additional and the Southern Forest Experiment Station $30,500, while $10,000 is provided for the establishment of an intermountain forest and range experiment station at Ogden, Utah, with regional studies of forest management and the methods of cutting western yellow pine.

There is also an increase of $25.000 in the allotment for studies of forest economics, with special reference to forest devastation and the more rapid development of private forestry.

For the Bureau of Chemistry and Soils there is an increase from $1,685,075 to $1,879,140. This includes $25,000 for the establishment of a soil erosion station in the Pacific Northwest; $36,000 additional for soil surveys, partly in flooded areas; $3,900 for a study of soil colloids; and $41,000 for soil fertility studies in the citrus and truck crop belt, the sugar beet area, the southeastern pecan belt, and in connection with cotton root rot. The bureau was also given $9,980 for fertilizer investigations, $16,235 for an extension of its insecticide and fungicide work, $10.000 additional for its project on the industrial utilization of agricultural wastes and culls, and $53,430 for a number of chemical studies of foods, fire-proofing, and paper.

The Bureau of Entomology will receive $2,704,204, a net increase of $355,552. Of this amount $61,420 is for work with deciduous fruit insects, divided among the nut case-bearer and other pecan insects, the oriental peach moth, the plum curculio, and various other apple insects, and including $20,000 for the introduction of parasites for the Japanese and Asiatic beetles. The increase for subtropical insects includes $25,000 for experimentation with citrus scale insects in California and $5,000 for studies of the cyclamen mite. The enlarged work with truck crop insects is mainly with wireworms in the Pacific Northwest and South Carolina, for which $25,000 and $7,500, respectively, is provided, but also includes $3.940 for work with the strawberry root aphis; $7,500 for the Lima-bean pod borer; and $5,000 for the pea weevil. The increase for forest insects is $16,000, of which $10,210 has to do with bark beetles in the Western States and the remainder with insects injurious to shade and park trees. For cereal and forage crop insects, additional allotments of $10,000 each are made for work with leafhoppers and similar pests of legumes, the range caterpillar, and sugarcane borer parasites, together with $8,992 for work with the alfalfa weevil and the Mormon cricket. There is also an increase for insects affecting man and animals of $37,100, of which $16,100 is for work with sand flies and related pests, $10,000 for mosquitoes, $6,000 for a study of the warble fly on reindeer in Alaska, and $5,000 for ticks. Allotments of $10,000 each are made to enlarge the work with clothes moths and similar household insects and a beetle infesting stored tobacco, and $5,000 is granted for a study of pests infesting confections and nut meats. The funds for taxonomy investigations are increased by $10,000, $14,740 is provided for additional work in cooperation with the Extension Service, and $50,000 is allotted for the purchase of the Barnes collection of Lepidoptera. An extension of basic beekeeping studies is authorized with an allotment of $5,600, and $15,000 is provided for inaugurating apicultural studies in the Pacific Coast States.

For the Bureau of Biological Survey there is a net increase of $267,320, making its new total $1,903,320. This is mainly for the maintenance and development of the various mammal and bird reservations and the enforcement of the Migratory Bird Act, but $39,703 additional is allotted for the control of rodents and other predatory animals, $7,000 for the study of problems of economic ornithology, $10,000 for biological investigations in relation to forest products, and $40,000 for experiments in establishing a musk-oxen industry in Alaska.

An increase from $570,400 to $667,900 for the Bureau of Public Roads is to be devoted entirely to projects in the division of agricultural engineering. The various items authorized include $75,000 for studies in the engineering phases of cotton ginning, $5,000 for enlarging a study of the irrigation of Oregon pears, $15,000 for work in the improvement of fertilizer distributing machinery, and $2,500 for drainage studies in Louisiana.

The total for the Bureau of Agricultural Economics, $6,485,390, represents a net increase of $427,930. Most of this increase pertains to the bureau's marketing, inspection, and statistical work, but $5,310 is provided for the study of production credit, $9,780 for expanding the studies of types of farming and agricultural readjustments, $25,000 for further research on factors affecting the outlook for farm products, $10,000 for inaugurating studies of the direct marketing of livestock, $22,100 for the studies of the situation as regards alfalfa meal, beans, soybeans, and tobacco, $10,000 for laboratory studies of the interrelationships between the properties of cotton fiber and the corresponding finished products, and $40,000 for further studies of foreign competition and demand. There is also allotted $50,000 for the enforcement of the Perishable Agricultural Commodities Act of June 11, 1930.

The funds of the Bureau of Home Economics are increased from $167,500 to $207,700. Of this amount $5,200 is a transfer from an allotment hitherto made to the Bureau of Agricultural Economics for cotton utilization studies now dealing largely with the wear of cotton fabrics produced from cotton of known grade and source and carried on under home economics direction. The remainder of the increase will provide $15,000 for studies of the vitamin content of human foods, and $10,000 each for studies of the methods of utilization of food products, especially meats, potatoes, and rice, and the food purchasing habits of housewives.

The work of the remaining branches of the Department will be continued on substantially the present basis. The Plant Quarantine and Control Administration will receive $3,728,800, the Grain Futures

Administration $172,640 (an increase of $32,640), and the Food and Drug Administration $1,616,000. Additional offices are to be established at Seattle, Wash., and Omaha, Nebr., in connection with the grain futures supervision and a chemical laboratory at Los Angeles for the enforcement of the food and drugs act.

Two miscellaneous appropriations of considerable general interest provide $30,000 toward the operation by the Department of the National Arboretum for which land is now being acquired in Washington, D. C., and $25,000 for the erection of an archway at the Roosevelt Memorial. This archway is to be built in accordance with an act signed by President Hoover June 2, 1930, will span the Theodore Roosevelt international highway on the Continental Divide at the summit of the Rocky Mountains, and is in memory of the leadership of President Roosevelt in the cause of forest conservation.

The passage by Congress of the appropriation act and its supplementary legislation was accomplished by the usual comprehensive hearings by the Bureau of the Budget and the House and Senate committees, but again occasioned little controversy at any stage. The relative absence of discussion seemed less to imply a diminution of interest in the legislation than a tacit acceptance of its general policies and program. The increase provided for the agricultural activities of the Department was the largest in several years and makes possible the development and strengthening of its work in many directions. The fact that nearly a quarter of the increase is for research is especially significant and encouraging.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The nature and identity of wheat glutenin, M. J. Blish and R. M. Sandstedt (*Jour. Biol. Chem., 85 (1929), No. 1, pp. 195–206*).—The extraction of repeated re-solution of glutenin in alkaline solutions of various concentrations brought about, in these experiments of the Nebraska Experiment Station, so marked an alteration in the nitrogen distribution of the protein as to lead to the conclusion that "glutenin, as prepared by customary methods . . „ is a product resulting from an irreversible alteration by the action of alkali on a more complex protein body." Both the yield and the chemical constitution of glutenin prepared by the usual methods varied with the concentration of the alkaline solution used in preparing it.

"A new 'glutenin' has been prepared by a procedure in which exposure to alkali is avoided at all stages. It differs from the usual glutenin both in physical properties and in chemical constitution." The method follows.

"Crude gluten is prepared from flour by kneading the flour-water dough under tap water in the usual manner. This gluten is finely macerated and placed in a large volume of very dilute acetic acid. After standing overnight it is thoroughly dispersed, giving a somewhat viscous solution with starch and other solid foreign material in suspension. Filtration being impossible, the solution is diluted with methyl-alcohol until an alcoholic concentration of 65 to 70 per cent is obtained. The dilute alcoholic solution is then passed slowly through a Sharples supercentrifuge, whereby starch and other suspended matter are removed, giving a highly opalescent sol. When this solution is neutralized to a pH slightly below 7 by slowly stirring in N NaOH solution (but never allowing the material to become alkaline), a heavy gelatinous protein precipitate comes down rapidly. The gliadin remains in the alcoholic solution, and is at once decanted off. The precipitate may be redispersed in dilute acetic acid and reprecipitated after the solution is again diluted with methyl alcohol. After two or three such treatments, followed each time by washing with water, the gliadin is completely eliminated as shown by absence of protein in the supernatant liquid. The precipitated glutenin is then dried in the usual manner with alcohol and ether."

A satisfactory separation of the glutenin by ethyl in place of methyl alcohol was found not possible, a result considered associated with the "known greater dehydrating power of methyl alcohol."

The amide nitrogen of the new type of glutenin was nearly 22 per cent, "decidedly higher" than amide figures for any recorded preparations made by the alkali method. A lower percentage of arginine in the new than in the old type of glutenin preparations was indicated, as was also the complete freedom of the preparations from gliadin contamination. Further, "the ultimate particles, or molecules, as the case may be, of the new protein are apparently of greater size and complexity than those of glutenin as ordinarily prepared by methods involving extraction with and exposure to alkali."

Proteins of the avocado (Persea americana Mill), D. B. Jones and C. E. F. Gersdorff (*Jour. Biol. Chem., 81 (1929), No. 3, pp. 533–539*).—By extracting the edible portion of the fruit of *P. americana* with 10 per cent sodium chloride solution, the authors of this contribution from the Bureau of Chemistry and Soils, U. S. D. A., obtained a protein having the general properties of a globulin. This substance coagulated at 68° C. from saline solution and was precipitated by acidifying with acetic acid or by adding ammonium sulfate to the extent of 67 per cent of saturation. The protein was found to have a nitrogen content of 15.31 per cent.

A second protein containing 13.42 per cent of nitrogen was precipitated from an alkaline alcohol extract by making the solution slightly acid with acetic acid, this material having been obtained from the residue remaining after the extraction with aqueous sodium chloride.

Finally, the dilution of the slightly acid alcoholic filtrate from the precipitation of the first of the alkaline alcohol soluble proteins caused the separation of a third fraction of alkaline alcohol soluble protein, of which the nitrogen content was 16.23 per cent. Of these three proteins, the elementary composition, the nitrogen distribution as determined by Van Slyke's method (E. S. R., 26, p. 22), and the contents of cystine, tryptophane, and tyrosine as determined by colorimetric methods, are given.

Studies on the combination between certain basic dyes and proteins, L. M. C. Rawlins and C. L. A. Schmidt (*Jour. Biol. Chem., 82 (1929), No. 3, pp. 709–716, figs. 2*).—Casein, fibrin, and gelatin were titrated, in the investigation here reported from the University of California, each with methylene blue, with safranine Y, and with induline scarlet, and edestin was titrated with the two dyes first named.

"The titration curves show that in the region of pa_H 11, gelatin binds 70×10^{-5} equivalents of dye, casein 210×10^{-5}, edestin 70×10^{-5}, and fibrin 168×10^{-5} equivalents. Within limits of error, and taking into account the possibility of modification of the protein taking place at high alkalinities, a correlation between certain groups in the proteins studied and their capacity for binding base can be made. This correlation suggests that the union between protein and basic dye under the experimental conditions observed takes place in stoichiometric proportions."

Plant hemagglutinins with special reference to a preparation from the navy bean, V. R. Goddard and L. B. Mendel (*Jour. Biol. Chem., 82 (1929), No. 2, pp. 447–463, fig. 1*).—This is a contribution from Yale University, in which it is reported that "a nontoxic, highly potent, soluble, hemagglutinating protein having the characteristics of an albumin was prepared in dry form from navy beans (*Phaseolus communis*)" by means of a procedure summarized as follows:

"After extraction of the defatted bean meal with sodium chloride solution (usually 3 per cent), removal of the undesired globulins by dialysis of the extract, repeated salting out of the desired protein with ammonium sulfate, and dialysis of the precipitate to remove inorganic contaminants, a clear, straw-colored filtrate was obtained which was evaporated in a current of air to dryness at 35–40° on glass plates. The protein was then scraped from the plates, further desiccated over sulfuric acid, and stored in the form of a nearly white powder in glass bottles. Upon analysis, the samples, with corrections for moisture and ash, varied in nitrogen content from 14.5 to 15.5 per cent. The material responded positively to all the common protein color and precipitation tests. This substance had a high hemagglutinating potency."

A quantitative nonmicroscopic method for estimating hemagglutinative power is also described.

The presence of electrolytes was found indispensable to the reaction, and the inhibiting action of certain proteins, especially egg albumin and serum proteins, was observed. Chemical changes leading either to denaturation or to hydrolysis of the protein lessened the hemagglutinative power.

Possible practical applications of the new hemagglutinin are briefly discussed.

The preparation of lysine, histidine, and arginine from hydrolyzed blood corpuscle paste by electrical transport, G. J. Cox, H. King, and C. P. Berg (*Jour. Biol. Chem., 81 (1929), No. 3, pp. 755–764, fig. 1*).—A contribution from the University of Illinois, this paper describes the construction of three-compartment electrodialysis cells from thoroughly paraffined pine wood provided with parchment paper membranes cooled by multiple S-bends of glass tubing carrying a stream of water and provided with graphite electrodes. In a study of the performance of this apparatus, it was found that "it is not necessary to stir the center compartment or to regulate the pH of any of the compartments during the transport of the amino acids from the hydrolyzed protein. During the retreatment for the separation of histidine, we have added sulfuric acid to the anode compartment to increase the conductivity of the cell. From the solutions obtained after electrical transport we have separated arginine as the flavianate, lysine as the picrate, and histidine as the double salt with mercuric sulfate. We have found that a somewhat higher yield of lysine and arginine may be obtained if the suspension of barium sulfate, which results from the neutralization of the sulfuric acid hydrolysate of the blood paste, is subjected directly to electrolysis. The yield of histidine is slightly lowered, however.

"The use of parchmentized paper reduces considerably the electroendosmotic transport of water and the consequent flooding of the cathode compartment toward the end of the electrolysis."

A note on the specific rotatory power of *d*-arginine, A. Hunter (*Jour. Biol. Chem., 82 (1929), No. 3, pp. 731–736*).—The specific rotatory power of *d*-arginine, measured for the D line at 20° and in the presence of an excess (8 molecules) of hydrochloric acid, is reported as at least +26.54°; the corresponding value for *d*-arginine hydrochloride was +21.94°.

Treated with nitrous acid according to the technic of Van Slyke, arginine gave off in 5 minutes at room temperature exactly one-fourth of its total nitrogen. In 0.5 hour the yield was about 5 per cent, in 3 hours about 30 per cent, greater. The statement that the nitrogen yield is doubled in 3 hours was not confirmed.

The apparent dissociation constants of tryptophane and of histidine, C. L. A. Schmidt, W. K. Appleman, and P. L. Kirk (*Jour. Biol. Chem., 85 (1929), No. 1, pp. 137–140, figs. 2*).—A tryptophane preparation and two preparations of histidine were purified and recrystallized, their titration curves were determined, and from these data were calculated the acid and basic dissociation constants and the isoelectric points.

For tryptophane the values obtained were $K'_a=4.05\times10^{-10}$, $K'_b=2.4\times10^{-12}$, and $pI=5.89$. These values were found in satisfactory agreement with previous results of other investigators. For histidine one of the preparations used yielded the figures $K'_a=7.5\times10^{-10}$, $K'_{b_1}=1.0\times10^{-8}$, and $K'_{b_2}=6.6\times10^{-13}$, the other giving the corresponding figures $K'_a=5.9\times10^{-10}$ and $K'_{b_1}=1.03\times10^{-8}$ "on the assumption that the average of the two sets of data represents the most probable value," $pI=7.6$. It is noted that the last named value is higher than that (7.2) "assumed by Vickery and Leavenworth" (E. S. R., 60, p. 203) in the development of a successful isolation method. The second histidine sample consisted of the free base prepared according to the method of Vickery and Leavenworth (E. S. R., 60, p. 413) by the authors of that method.

A study of the action of trypsin on casein, H. W. Vahlteich (*Jour. Biol. Chem., 82 (1929), No. 3, pp. 737–749, figs. 5*).—A contribution from Columbia University, the paper here noted reports "a systematic study of the tryptic hydrolysis of casein . . . made by following the progress of production of amino nitrogen, proteose nitrogen, and of the transformation of casein nitrogen into the products of digestion at 20, 30, and 40° for several concentrations of enzyme. The data presented show that for all concentrations and temperatures studied the proteose nitrogen reaches a maximum at about the time that the transformation of the original substrate is complete. For all concentrations of enzyme at all three temperatures a fairly definite relationship holds between the forms of nitrogen studied in that the production of maximum proteose nitrogen, the complete transformation of the original substrate, and the production of a definite quantity of amino nitrogen all occur at about the same time." Comparison of the periods required for the conversion of various quantities of casein into "the products of digestion" was found "a useful gage of tryptic activity, but a similar comparison of proteose nitrogen gives only rough approximations."

Further, "in using the production of amino nitrogen as a measure of proteolysis, it is essential to choose a comparatively narrow range of amino nitrogen production (about 10 to 12 per cent of the total nitrogen of the substrate) to obtain a relationship of time intervals comparable to the amounts of enzyme used. A comparison of the time intervals within the range of amino nitrogen production most favorable to a comparison of enzymic activity shows the increase in the rate of hydrolysis per 10° rise in temperature between 20 and 40° to be about 2."

The Van Slyke (E. S. R., 26, p. 22) and Sörensen methods for amino nitrogen gave practically parallel results.

The effect of the position of substitution on the apparent dissociation constants of certain amino acids, C. L. A. Schmidt, W. K. Appleman, and P. L. Kirk (*Jour. Biol. Chem., 81 (1929), No. 3, pp. 723–726, figs. 2*).—The authors of this contribution from the University of California Medical School determined the apparent dissociation constants as acids and as bases of α-amino-n-valeric acid, β-alanine, γ-amino-n-valeric acid, and δ-amino-n-valeric acid, and found on plotting against the reciprocals of the distances of the amino groups the logarithms of the apparent dissociation constants that the data yielded straight lines.

The reaction between nitrous acid and certain amino acids and related compounds at 45°, C. L. A. Schmidt (*Jour. Biol. Chem., 82 (1929), No. 3, pp. 587–594, fig. 1*).—Carrying out the reaction at the temperature indicated, the author of this contribution from the University of California Medical School found that "glycocoll, glycyl-glycine, cystine, cysteine, tryptophane, arginine, and an unsaturated oxyindole derivative yield more nitrogen than can be accounted for on the basis of the free amino groups. Other substances tested were found to react normally."

With respect to the abnormal behavior of cystine and cysteine, it is stated in part that it appears that this behavior "can be connected with their sulfur radicals. When cystine is shaken for several minutes either at room temperature or at 45° with nitrous acid, several drops of barium chloride solution being added to the mixture, a precipitate of barium sulfate forms which increases in amount as the shaking is continued." High results in the case of glycine were found more difficult of explanation, but apparently "the reaction is one of oxidation involving the formation and subsequent decomposition of an intermediary compound. This is conditioned upon the presence of an amino group in the molecule which is acted on. Probably a similar type of reaction takes place when cystine sulfur is oxidized by nitrous acid. When the amino group of glycocoll is protected, as in leucyl-glycine, this intermediary compound probably does not form."

On the molecular size of the carbohydrates obtained from egg proteins, P. A. Levene and A. Rothen (*Jour. Biol. Chem., 84 (1929), No. 1, pp. 63–68*).—"On the basis of the diffusion coefficient," the authors conclude that "the polysaccharide prepared from the egg proteins consists of four trisaccharides, each having an approximate molecular weight of 500, which weight corresponds to that required by theory for the substance consisting of 1 molecule of glucosamine and of 2 molecules of mannose."

The condensation of aromatic aldehydes with glycine and acetylglycine, H. D. Dakin (*Jour. Biol. Chem., 82 (1929), No. 2, pp. 439–446*).—The preparation and characteristics of the following derivatives are recorded: Acetylglycine, α-acetaminocinnamic acid, azlactone of α-acetaminocinnamic acid, azlactone of *o*-acetoxy-α-acetaminocinnamic acid, α-acetaminocoumarin, azylactone of *p*-acetoxy-α-acetaminocinnamic acid, *p*-hydroxy-α-acetaminocinnamic acid, azlactone of α-acetaminopiperonylacrylic acid, α-acetaminopiperonylacrylic acid, azlactone of α-acetamino-*p*-nitrocinnamic acid, and α-acetamino-*p*-nitrocinnamic acid.

The composition of the cells of certain bacteria with special reference to their carbon and their nitrogen content, E. W. Hopkins, W. H. Peterson, and E. B. Fred (*Jour. Biol. Chem., 85 (1929), No. 1, pp. 21–27*).—The organisms used in the work described in this contribution from the Wisconsin Experiment Station were (1) a strain of *Rhizobium meliloti*; (2) a strain of *Clostridium acetobutylicum* A, commercially important in the production of butyl alcohol; and (3) *Lactobacillus leichmanni* A, a typical lactic acid organism. The material was separated by means of the supercentrifuge from media free from sterilization precipitates or, in the case of material grown on agar, the organisms were washed from the surface of the medium with water, the suspension was filtered through cotton to insure the absence of particles of the agar, and the filtered suspensions were run through the supercentrifuge.

The nodule bacteria were found to contain carbon 52.8 to 54.6 per cent and nitrogen 4.4 to 4.9 per cent, the butyl alcohol-producing form carbon 47.4 and nitrogen 11.2 per cent, and the lactic acid bacteria carbon 46.0 to 47.9 per cent and nitrogen 11.3 to 12.3 per cent.

The total ether and chloroform extracts were 11.4 to 22.6, 3.0, and 1.8 per cent, respectively, the chloroform extract comprising the greater part of the lipid material. On the basis of the solubilities noted, it was concluded that but little of the extracted material was true fat.

"From the above data and the moisture determinations, the approximate composition of the cells was calculated. The moisture content of the three organisms was essentially the same. The dry matter of the nodule bacteria consisted chiefly of carbohydrate, and that of the other two species mainly of protein."

The effect of hydrogen ion concentration on saponin hemolysis, M. Bodansky (*Jour. Biol. Chem., 82 (1929), No. 3, pp. 567–577, figs. 5*).—The changes in the reaction of the erythrocytes of dog blood and of human blood to saponin with variations in the hydrogen-ion concentration, as observed in the experiments here reported from the University of Texas, led to conclusions thus stated.

"On the acid side of the isoelectric point of the red blood corpuscle (pH about 4.6), as the positive charge increases, the resistance of the cell to saponin diminishes. On the alkaline side of the isoelectric point, as the cells become more and more negatively charged, their resistance to saponin increases gradually to about pH 8.5, after which the resistance increases more rapidly, reaching a maximum at about pH 10."

As explaining the effect of inorganic acids and bases, "their chemical combination with globulin and possibly other proteins of the cell membrane, such as globin," is suggested. Curves represent the hemolysis rates observed under the various experimental conditions imposed.

The influence of neutral salts on the pH of phosphate buffer mixtures, H. W. Robinson (*Jour. Biol. Chem., 82 (1929), No. 3, pp. 775–802, figs. 6*).—"From the experimental data given . . ., and from the equations deduced from them, it is felt that the conditions existing in phosphate buffers, either without or with the addition of neutral salts, can be understood more clearly than hitherto. The results reported here for 38° agree well with others for room temperature and indicate that the temperature effect on the Debye-Hückel constant is negligible."

In mixtures of phosphates with alkali metal halides, it was found necessary to consider the ionic concentration of the neutral salt separately rather than to use the total ionic concentration. "It is probable that some adjustment of the constants may make this unnecessary, but since adjustment of constants is empirical, it seemed best for the present to separate the effects. The accuracy with which this treatment represents the experimental data should justify itself for the major purpose of this work, which was to obtain information concerning this system which could be used in biological work."

An improved form of the quinhydrone electrode, G. E. Cullen (*Jour. Biol. Chem., 83 (1929), No. 3, pp. 535–538, fig. 1*).—The construction of the device is thus described:

"A T-tube [about 7 mm. in diameter] is selected in which the upper bar is perfectly straight, and in which there is no constriction at the joint, and one end of the upper bar is drawn out to a capillary. . . . The capillary portion is about 2 mm. in outside diameter and about 3 to 5 cm. long, the only important requirement being that the end of the capillary must be at least 1 to 1.5 cm. below the end of the metal electrode. The tip of the capillary is slightly constricted. The electrode proper, carrying the wire electrode, is prepared from glass tubing about 5 mm. in diameter that fits easily into the electrode vessel. A piece of C. P. platinum wire 0.6 mm. in diameter and about 3 cm. long is fused . . . to a slightly heavier piece of copper wire (No. 20) which serves as the lead-off wire. This wire is then fused into the glass tube with the Cu-Pt joint just inside the tube. The glass is drawn down as a smooth tip over the wire to about the same shape as that of the funnel-shaped portion of the electrode vessel at the beginning electrode capillary portion so that when the electrode is in place only a capillary space is left between the electrode and vessel. . . . The upper end of the glass tubing is filled with De Khotinsky cement. . . . A section of glass rod about 5 mm. in diameter that fits snugly but easily into the side arm is selected, and the ends rounded. . . . The electrode and the plunger are held in position in the electrode vessel by short pieces of transparent acid-cured rubber tubing."

For a determination, the apparatus having been made clean and dry, "the inner surfaces of the rubber tubing sleeves are moistened with distilled water. The platinum wire is moistened with distilled water, touched to finely powdered quinhydrone so that a generous amount adheres, and the electrode, carrying its load of quinhydrone, is inserted into the electrode vessel as far as it will go. The glass plunger is inserted into the wet surface of the rubber tubing at the end of the side arm. The assembled apparatus is then dipped into the solution to be tested, and by gentle withdrawal of the plunger the solution is drawn up into the capillary to cover the entire electrode. It is then placed at once in the KCl connecting vessel so that the surface of the fluid in the electrode is slightly above the level of the saturated KCl solution."

A micro electrode and vessel for the determination of the hydrogen ion concentration of blood media, whole blood, and other biological fluids, A. J. Salle (*Jour. Biol. Chem., 83 (1929), No. 3, pp. 765–772, figs. 2*).—A micro electrode and vessel suited to the determination of the hydrogen-ion concentration of biological fluids in samples of a few drops only of the material, "so constructed that a minimum of contact is automatically obtained between the fluid and electrode," and with circuit closure so arranged that "readings are practically instantaneous, before there is any appreciable loss in the concentration of carbon dioxide and oxygen," is described and illustrated in this contribution from the bacteriology department of the University of California.

"The results obtained show very good agreement with the colorimetric method."

A micro time method for determination of reducing sugars, and its application to analysis of blood and urine, J. A. Hawkins (*Jour. Biol. Chem., 84 (1929), No. 1, pp. 69–77, figs. 2*).—A method dependent on the measurement of the time required for the sugar content of the sample solution to reduce the ferricyanide content of a known volume of a 0.5 per cent solution to the colorless ferrocyanide "has been refined so that 0.2 cc. of blood suffices for duplicate analyses."

Determination of sugar in blood.—I, Observations upon Benedict's alkaline copper solution, M. R. Everett (*Jour. Biol. Chem., 82 (1929), No. 2, pp. 369–376*).—A study of the effect of sulfite used in an alkaline copper solution of Benedict (E. S. R., 54, p. 10) upon the copper solutions used in determining sugars is reported from the University of Oklahoma Medical School. "The result, without exception, has been a lowering of the apparent blood sugar values, regardless of the nature of the other components of the alkaline copper solutions. Thus, blood sugar values 10 to 20 per cent lower than similar Folin-Wu values were always obtained with sulfite-copper reagents which contained malate, glycine, salicylate, or pyridine in place of tartrate, or with reagents in which tartrate was combined with these substances or with phthalate, phosphate, etc. Moreover, the Folin-Wu copper reagent gave similar low values when proper amounts of sulfite were added to it." Further, "the effect of sulfite is a general one. With no copper mixture it is entirely inactive, and it always causes intense reduction by itself if enough be added to a copper mixture. On the other hand, the sensitivity of alkaline copper mixtures to reduction by sulfite is quite variable. For example, the Folin reagent is so sensitive that very small amounts of sulfite give a marked blank. Decreasing alkali concentration appears to increase the sensitivity of copper reagents to reduction by sulfite. Reagents containing malate or glycine are less sensitive to sulfite reduction than those containing tartrate."

The oxidative determination of phospholipid (lecithin and cephalin) in blood and tissues, W. R. Bloor (*Jour. Biol. Chem., 82 (1929), No. 2, pp. 273–286*).—"The oxidative procedure with chromic acid, . . . recently extensively modified, offered a satisfactory method of measurement, and the ordinary method of isolation of the phospholipids by precipitation from ether or petroleum ether with acetone and magnesium chloride has been found to give satisfactory results on milligram amounts of lecithin and cephalin."

Basic amino acids: The estimation of the basic amino acids in small amounts of casein and edestin by the modified method of Vickery and Leavenworth and other methods, H. O. Calvery (*Jour. Biol. Chem., 83 (1929), No. 3, pp. 631–648*).—Noting that the recent method of Vickery and Leavenworth (E. S. R., 60, p. 414) "is without doubt the most accurate yet described," the author of the present contribution from the University of Michigan none the less finds the requirement of 50 gm. of the protein an inconvenience in the cases, especially, of certain proteins of physiological importance, and here describes in detail a slightly modified form of the Vickery and Leavenworth procedure, in which the method is adapted for accurate work with 5 gm. of the protein.

"The basic amino acids of casein and edestin were determined by this method with very consistent results. The values obtained for edestin correspond very closely with those reported by Vickery and Leavenworth, and the values for the lysine content of casein correspond well with that obtained by Leavenworth when very large quantities of casein are used."

For comparison, estimations of various of the basic amino acids were made by several methods, the results in most cases agreeing well with those of the modified form of the original Vickery and Leavenworth method for the entire basic group.

A further finding was that "the total nitrogen of the arginine fraction is not a true indication of the amount of arginine present, while the alkaline hydrolysis method of Van Slyke [E. S. R., 26, p. 22] probably is a true indication. The isolation method gives values corresponding closely with those obtained by alkaline hydrolysis."

The results recorded indicate the possibility of determining the basic amino acids "with a considerable degree of accuracy" in the small quantities of protein used.

The oxidation of dixanthydryl urea by means of the dichromatic reaction: A new method for determining urea, F. W. Allen and J. M. Luck (*Jour. Biol. Chem., 82 (1929), No. 3, pp. 693–701*).—In this contribution from Stanford University is described a micro method for the precipitation of urea as dixanthydryl urea from urine, blood, and animal tissues. The derivative was estimated by oxidation with potassium dichromate and sulfuric acid. The excess of the oxidizing agent was determined iodometrically. "For the determination of urea in muscle and other tissues the use of copper sulfate and baryta is recommended for clarification of the tungstic acid extract."

Determination of calcium in the presence of iron and aluminum, R. C. Wiley (*Soil Sci., 29 (1930), No. 5, pp. 339–347*).—This is an experimental critique of current methods, contributed from the University of Maryland and reporting the following findings:

The calcium ion was not appreciably adsorbed by the hydroxides of iron or aluminum when all ammonia was removed by boiling after these hydroxides had been precipitated. The calcium ion was not appreciably adsorbed by the hydroxides of iron and aluminum when the solution was cooled with a stream of carbon dioxide after these hydroxides had been precipitated. The presence of a moderate excess of ammonium hydroxide resulted in coprecipitation of calcium with the hydroxides. If the solution was saturated with carbon dioxide after the precipitation of the iron and aluminum hydroxide and before they were filtered off, no loss of calcium from the solution resulted.

"The double precipitation of the hydroxides of iron and aluminum is unnecessary when calcium is being determined, provided all ammonium hydroxide is removed from the solution and no ions that form insoluble compounds with calcium are present."

METEOROLOGY

World weather.—IV, Some applications to seasonal foreshadowing, G. T. Walker and E. W. Bliss (*Mem. Roy. Met. Soc., 3 (1930), No. 24, pp. 81–95, figs. 4*).—In papers previously noted (E. S. R., 60, p. 16) "relationships between seasonal characteristics over the world have been applied to the working out of formulas for seasonal prediction in several regions." In this paper "statistical methods have been applied to foreshadowing the winter temperatures of western Canada (R=0.71), Dawson (R=0.72), the summer rains of South Africa, excluding Natal (R=0.72), and the summer rains of northern and northeastern Australia (R=0.79)." The authors urge that "instead of speaking of 'forecasting' seasonal rainfall we should say 'foreshadowing' it, for forecasting is a more ambitious term and has associations with daily weather predictions made on every occasion with a high probability of success."

The atmosphere and the sun, H. H. Clayton (*Smithsn. Misc. Collect., 82 (1930), No. 7, pp. 49, figs. 33*).—This paper is a continuation of those previously noted (E. S. R., 56, p. 15), reporting studies of the relation of solar activity to atmospheric changes and weather forecasting.

Conclusions are reached which the author thinks "mean a revolution in present methods of weather forecasting. The forecasting of pressure and temperature will be made in much the same way that ocean tides are now predicted, except that the periods used will be solar periods rather than lunar periods." An example of successful forecasting of atmospheric pressure is presented which "seems conclusive evidence that day to day weather is not a haphazard occurrence, as many persons believe, but is subject to calculation."

[Agricultural meteorological work of the Agricultural Institute of the University of Halle] (*Kühn Arch., 20 (1929), pp. VIII+378+303–377, pls. 2, figs. 39*).—This volume contains the following articles: Agricultural Meteorological Investigations of the Agricultural Climatological Region of the Province of Saxony, by P. Holdefleiss (pp. 1–5); Variations in Barometric Pressure in Middle Europe and its Influence on Crop Yields in Germany, by H. Schultze (pp. 7–139); The Dependence of Crop Yields on Weather Factors, by R. Scheinert (pp. 143–222); The Dependence of Crop Yields on Weather Factors in the Region between the Saale, Mulde, and Elbe, by R. Schulze (pp. 223–301); Agricultural Climatological Characteristics of the Rainfall Deficient Harz Region of Anhalt, by W. Neustädt (pp. 304–378); Agricultural Climatological Studies of the Region between Middle Saale and Pleisse and the Climatic Subdivisions of the Region with Reference to Relation between Weather Factors and Crop Yields, by E. Höhne (pp. 303–369); and Review of the Results of Previous Work on the Dependence of Crop Yields on Weather Factors, by P. Holdefleiss (pp. 371–377). These papers discuss in great detail the results of many years' study of the various local environmental conditions affecting crop yields. Many of the papers include useful bibliographies.

The climate of Arizona, H. V. Smith (*Arizona Sta. Bul. 130 (1930), pp. 339–416, figs. 12*).—This bulletin summarizes available data for temperature, frosts, precipitation, humidity, sunshine, wind, and evaporation at various places in Arizona, and discusses the relation of climate to health and agriculture, with special reference to agriculture in the Salt River Valley and at Yuma.

Climatically, the State has "a minimum of rainfall, humidity, and cloudy weather. Few cyclonic storms cross the area, which is characterized by intense sunlight, a wide range in temperature, and dry air. . . . A mean annual rainfall of but 13.61 in. precludes the possibility of any great amount of dry farming in Arizona."

Meteorological observations, [May–June, 1930], C. I. Gunness, D. F. Murphy, and F. R. Shaw (*Massachusetts Sta. Met. Ser. Buls. 497–498 (1930), pp. 4 each*).—Observations at Amherst, Mass., are summarized and briefly commented upon.

Monthly rainfall maps of Wisconsin and adjoining States, E. R. Miller (*Wis. Acad. Sci., Arts, and Letters, Trans., 25 (1930), pp. 135–156, figs. 13*).—

Average monthly rainfall during 32 years, 1897–1928, at 215 stations in Wisconsin and adjacent parts of Illinois, Iowa, Michigan, Minnesota, and Nebraska, is shown in tables and maps similar to those previously noted (E. S. R., 62, p. 409). The average annual rainfall of the region is 31.37 in., varying from 1.1 in. in January to 4.19 in. in June, with a secondary peak of 3.82 in. in September.

SOILS—FERTILIZERS

[Soil and fertilizer notes from the Texas Station] (*Texas Sta. Rpt. 1929, pp. 14, 55, 56, 98, 124, 131, 132*).—These pages of the report contain the following soil and fertilizer items, not previously noted.

Nitrification.—The addition of calcium carbonate brought about the nitrification of ammonium sulfate in many soils incapable of nitrifying the salt without liming.

Composting raw phosphate rock and sulfur with different soils.—The use of sulfur alone as a fertilizer is reported to have been unprofitable from the point of view of crop increase in trials at six substations. Attempts to control cotton root rot by means of sulfur applications on a dark calcareous soil at the Temple Substation were also a failure.

Rotation, fertilizers, and soil improvement.—"For the 15-year period, superphosphate and manure gave an average yield of 219 lbs. of lint cotton to the acre. This was also the high-yielding treatment for 1928, with 375 lbs. of lint cotton to the acre in the rotated cotton, while the nonrotated cotton yielded 181 lbs. of lint cotton. For the 15-year period, manure alone gave the highest yield of shelled corn, 24.2 bu. to the acre; this was also the high yielder for 1928 with 26.7 bu. to the acre, the same treatment in the nonrotated corn producing only 22.4 bu. Lime increased the yields of the nonrotated corn, but in the rotated corn the yields from the limed plats were reduced. For the 13-year period, cottonseed meal and superphosphates gave the highest average yield of oats, 18.1 bu. to the acre."

Soil fertility studies.—"Stable manure and superphosphate have produced the highest yield of cotton, 360.2 for the 2-year period, while in 1928 the treatment produced 439 lbs. of lint cotton to the acre. The manure and superphosphate also produced the highest average yield of corn, 27.8 bu. to the acre.

"A treatment of 200 lbs. to the acre of 4–12–4 produced the highest yield of oats, 30.1 bu., while 800 lbs. to the acre of 8–12–8 produced the highest yield of straw, 3,402 lbs. to the acre."

Run-off and soil-erosion studies.—The collection at the Spur Substation of rainfall data and the determination of the water losses from control plats are noted, together with studies of various forms of terraces. The precipitation data showed, among other indications, that some 20 per cent of the rainfall recorded was ineffective because of its occurrence in the form of small showers, a further 20 per cent of the total being lost as run-off. Native grass, milo, cotton, and fallowing had the indicated decreasing order of effectiveness as measures against run-off and erosion.

In the terracing investigation "the entire rainfall has been conserved on an 8-acre area by the use of level terraces with the ends closed. There has been a materially increased yield of cotton on this area without damage from excessive amounts of water." Terraces having a slope as slight as 3 in. in 100 ft. were much less effective in water conservation than were level terraces.

Soil improvement investigations.—Fertilizer and rotation trials of the usual type are recorded from the Nacogdoches Substation.

A holder for soil sample bags, N. McKaig, jr. (*Soil Sci., 29 (1930), No. 3, pp. 191, 192, fig. 1*).—"The holder consists of a 1¼-in. iron rod, the upper end of which is bent in the form of a circle. For the standard canvas bag used by the Bureau of Chemistry and Soils, U. S. Department of Agriculture, a circle with an inside diameter of 3½ in. is satisfactory. Four small holes are drilled in the rod at equal intervals, and in each is fastened a nail or ⅛-in. by 1-in. bolt, sharpened and bent to form a curved hook whose point extends about a half inch toward the center and about a half inch above the top of the circle." The lower end of the straight part of the rod is pointed for pushing into the ground. The device is represented by a drawing.

The brown earths [trans. title], A. Stebutt (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 15 (1929), No. 2–3, pp. 134–167, figs. 3*).—A short monograph on the theory of the formation of the brown earths, this is a detailed discussion taking up the topics disaggregation and synthesis, factors in the formation and breakdown of zeolites, stratification in the soil layer (leaching and accumulation), consideration of the soil-forming processes from the morphological and chemical viewpoints, the brown earth zone, the formation of the brown or red colors, brown earth formation in chemical terms, and the morphological characteristics of the brown earth profile.

Properties of organic hardpan soils with special reference to their formation, L. A. Richardson (*Soil Sci., 29 (1930), No. 6, pp. 481–488, fig. 1*).—Noting that "approximately one-half of the 35,000,000 acres of land in Florida are classed as flatwoods soils," which have a low agricultural value and "contain a dark brown to black compact stratum 15 to 30 in. below the surface and 8 to 12 in. thick," this communication from the Florida Experiment Station reports a study of the material described.

No significant differences in reaction were demonstrated as between the hardpan and the nonhardpan soils. Mechanical analyses indicated a lower silt and clay content in the hardpan. No definite concentration of calcium or of iron in the hardpan could be shown, but a very distinct concentration of aluminum in the hardpan layer was evident. The carbon-nitrogen ratio, which decreased from the surface downward in the nonhardpan soil, remained almost constant in the hardpan stratum.

"The results indicate that under the climatic conditions of Florida, a loose sand, low in silt and clay and free of electrolytes, is favorable for the formation of an organic hardpan wherever the water table is near the surface (6 to 36 in.) during part of the year."

Effect of burning upon the accumulation of organic matter in forest soils, R. M. Barnette and J. B. Hester (*Soil Sci., 29 (1930), No. 4, pp. 281–284, fig. 1*).—Comparing the cut-over soil (Norfolk medium fine sand) of an island of which the land had not been burned over for 42 years with cut-over land of similar soil type in a portion of the mainland burned almost every year throughout the same period, the Florida Experiment Station finds that "it appears that the protection of the forests on the island has led to the conservation of the organic matter and nitrogen in this soil. A total loss of 121,289 lbs. of organic matter to the acre by burning is shown. Calculated on the basis of 42 years that the island soils have been protected, this amounts to an annual loss of 2,888 lbs. an acre. A total loss of 1,126 lbs., or an annual loss of 27 lbs. of nitrogen to the acre is indicated. It can not be doubted that the burning depletes markedly not only the potential supply of the plant nutrients to the growing timber, but also that it destroys the potential organic matter supply of the soil."

In addition to these effects, it was found further that the exchangeable calcium content and the content of hygroscopic moisture had also been affected.

"These differences are no doubt associated with the differences in the organic matter content. Only in the 0–9 in. depth of soil did the replaceable lime content of the burned over land exceed that of the unburned land. This higher content of replaceable lime in the surface soil of the burned area is no doubt due to the accumulation of the ash constituents in the surface soil."

Some analytical data are tabulated.

The nitrogen content of the soil as related to the precipitation-evaporation ratio, H. Jenny (*Soil Sci., 29 (1930), No. 3, pp. 193–206, figs. 6*).—Extending his mathematical discussion of soil nitrogen relationships (E. S. R., 60, p. 118), the author proceeds to the formulation of the nitrogen-moisture relationship for regions of like temperature in order "to clarify further the effect of the climate upon the nitrogen content of the soil." The topics taken up include mathematical formulation, interpretation of the curves, the carbon-nitrogen ratio, etc.

"A study was made to ascertain the relation between N. S. Quotients[1] (e. g. substitute for the true precipitation-evaporation ratio) and total nitrogen content of soils in regions of equal temperature. The two isotherms selected belong to the temperate region (annual temperatures 51 to 53° F.) including territory in Colorado, Kansas, Missouri, Illinois, Indiana, Ohio, and New Jersey, and to the subtropical region (annual temperatures 64 to 68°) in the States of Texas, Louisiana, and Mississippi. In both regions the average nitrogen content of grassland soils increases logarithmically with humidity factors (N. S. Quotients), while the nitrogen content of subtropical timber soils is not influenced by humidity factors. The nitrogen-humidity factor relationship is a discontinuous one, consisting of two separate curves, one for grassland soils and one for timber soils. In the temperate region the carbon-nitrogen ratio does not vary with the humidity factors. Its avearge value is about 11.3."

Periodicity of the nitrate content of soils, H. N. Batham and L. S. Nigam (*Soil Sci., 29 (1930), No. 3, pp. 181–190, fig. 1*).—Data of many investigators and representative of various European countries, several States of the United States, and of Egypt, South Africa, India, and New South Wales are here collected and analyzed, the paper being a contribution from the Department of Agriculture, United Provinces, India.

For both the Northern and Southern Hemispheres, the figures collected are considered to indicate in the aggregate a maximum of nitrate accumulation during the summer months, a minimum during the winter months, and apparently "close relationship between the fluctuations of nitric nitrogen content of soils and different seasons of the year," and the great importance of "solar activity . . . in controlling the nitrifying bacterial activity in soils."

A considerable reference list is appended.

The effect of alfalfa and sweet clover roots and tops on carbon dioxide evolution and accumulation of nitrates in the soil, T. L. Martin (*Soil Sci., 29 (1930), No. 5, pp. 363–369, figs. 5*).—The rates of nitrate formation and of carbon dioxide evolution from soil to which had been added the roots and tops, separately and in combination, both of alfalfa and of sweetclover, as well, also, as wheat straw, were experimentally considered.

The carbon-nitrogen ratio theory of the decomposition of the plant residues in the soil appeared to hold in the cases noted, "except for some factor which throws sweetclover out of its expected place during the first few weeks. From the period when this discrepancy occurs, the author thinks that there are organisms, the Mucors in this case, which differ in activity according to the type of organic matter, and therefore disturb the results which would be obtained with a greater or lesser activity of these organisms. The organism present in large and vigorous colonies therefore must be considered in decomposition studies."

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[1] N. S.=Niederschlag und Sättigungsdefizit (P. S. Quotient).

Biochemical investigation of the soil [trans. title], A. J. J. Vandevelde and A. Verbelen (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 16, pp. 977–979*).—The authors attempted the staining of bacteria in soil extracts with methylene blue, but found the dye flocculated in such a manner as to obscure the organisms. They then made use of the milk proteins to act as protective colloids for methylene blue, proceeding as follows: Samples consisting each of 1 gm. of the soil were taken aseptically and aseptically weighed, and were shaken 30 minutes in sterilized flasks with 100 cc. each of centrifuged and sterilized milk. To prevent further growth of the organisms, 1 cc. of 40 per cent formaldehyde was added to each 100 cc. of the milk. After the soil had been allowed some few minutes to settle out from the mixture, the organisms in the supernatant liquid were stained and counted, the mean of 10 fields being taken as the final result.

With the use of this simple and rapid procedure were investigated (1) the relation of microbial numbers to H-ion concentration in 30 samples of soils described as of a wide variety, and (2) the variations observable in a soil during the germination of seed.

The soils used in the first of these groups of experiments ranged in pH value from 5.11 to 7.95, and the numbers of microorganisms found from 1,280,000,000 to 21,600,000,000 in 1 gm. of soil. No relation between the two sets of figures is considered to have been shown, however, and further, considerable variations in numbers of organisms were found as between samples taken from different parts of the same soil area.

The second group of experiments yielded the general indication of a diminution in the number of microorganisms during germination of seed. On the other hand, when the soil had been sterilized prior to the germination experiment, the microorganisms increased in number during the germination.

The results of X-ray and microscopical examinations of soil colloids, S. B. Hendricks and W. H. Fry (*Soil Sci., 29 (1930), No. 6, pp. 457–479, pls. 2*).—By microscopical examination and by means of X-ray diffraction photographs made by the powder method, the finely divided materials separated from soils by suspension methods were shown, in the work reported in this contribution from the U. S. D. A. Bureau of Chemistry and Soils, to contain crystalline substances. By comparing the powder diffraction patterns with those of known clay minerals, it was shown that montmorillonite-beidellite, Ordovician bentonite, and halloysite are among the usual mineral constituents of soil colloids; and in two samples bauxite was found.

It was also found that fine fractions from a specific soil type, though obtained from samples taken in "widely different localities," gave diffraction patterns of the same type.

Colloidal content and related soil factors as indicators of site quality, I. T. Haig (*Yale Univ. School Forestry Bul. 24 (1929), pp. 33, figs. 5*).—The work here recorded "was based on a sample of 95 paired measures of soil value and site conditions distributed throughout 26 forest plantations. Average height growth of red pine was used as a measure of site quality. The main purpose was to measure the value of colloidal content as an indicator of site quality, and to make such incidental observation of the value of other soil measures as the character of the data would permit." The following conclusions are considered specific for the brown, slightly podsolized forest soils of southern Connecticut and of certain adjacent territory, and to be applicable "particularly to such of these [soils] as occur commonly in the vicinity of New Haven":

It was found that (1) as measures of soil conditions the soil values of the A horizon appeared superior to similar figures yielded by the B and C horizons. (2) Colloid content and the closely related silt-plus-clay content were both found to be correlated definitely with site quality, the silt-clay figures giving a correlation index of 0.58±0.07. " Site index values predicted from silt-plus-clay content will fall, in approximately 68 per cent of the cases, within ±1.32 and, in practically all cases (95 per cent), within ±2.6 ft. or about one broad site class of the actual site index. Colloidal content and silt-plus-clay content are fair measures for site quality."

(3) The organic matter content varied between 2 and 10 per cent and was found without significant influence on soil fertility. "The value of soil type as an indicator of site quality can not be accurately estimated with the data available. The application of this method would require an immense amount of preliminary work to determine the average site quality of each soil type and, at best, soil type would be but slightly superior to soil class as a measure of fertility. [4] A knowledge of the soil class (the textural quality of the A horizon or surface soil) permits classification of soil quality within approximately one broad site class. Approximately 68 per cent of the site indices predicted from this measure will be within ±1.2 ft., and practically all (95 per cent, within ±2.3 ft. of the actual site index. Considering the relative ease with which this factor can be estimated by a trained investigator, it offers an excellent method for determining the site quality of forest soils."

Permeability of soils (*New Mexico Sta. Rpt. 1929, p. 40*).—Before chemical treatment of the plats of alkali soil, " the control plats with one exception were less alkaline than the corresponding plats receiving the treatments. One year after the treatments the treated plats, with two exceptions, were less alkaline than the control plats. The control plats, with two exceptions, increased in alkalinity during the year. . . . The plats receiving the amendments produced from 1 to 7 lbs. more cotton per 100-ft. row than the more alkaline plats not receiving the treatments. There was no distinct correlation between yield of cotton and the percentage of moisture or alkali in the soils. . . . The maximum pH was 8.65 and the minimum 8.23."

A new method of measuring the comparative rate of percolation of water in different soils, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 22 (1930), No. 5, pp. 438–445, fig. 1*).—For comparing percolation rates of water through soils of different character, the author of this contribution from the Michigan Experiment Station proposes wetting the soil thoroughly in an excess of water and then, the sample having been transferred to a Büchner funnel of standard dimensions, drawing off the water while the sample in the funnel is kept constantly covered with water by means of reduced pressure held constant, if necessary, by the use of a regulation manometer, the rate of collection of the water drawn through the soil being conveniently observed by collecting in a cylindrical graduate. It is noted that while the soil-water mixture must be stirred after it has been placed in the funnel, this stirring must be sufficient only to break up any lumps remaining after the soaking and not sufficient to disperse the soil.

A considerable number of data yielded by the method and apparatus described are presented in support of the claim of its accuracy for comparative purposes.

"All that can and should be expected from this laboratory percolation method is to show the comparative permeability of the different kinds of soils under a comparative or similar set of conditions, or to show reliably the permeability of any one soil under different sets of conditions or treatments, but it should not be expected to show the permanent or absolute permeability of soils because there is no permanent or absolute permeability of soils either under laboratory or field conditions."

Soil moisture phenomena in a saturated atmosphere, L. B. Linford (*Soil Sci., 29 (1930), No. 3, pp. 227–237, pl. 1, fig. 1*).—Referring to the assumptions (1) of uniform spherical soil particles and (2) of a zero contact angle between soil particles and water, made by him in an earlier contribution from the Utah Experiment Station (E. S. R., 56, p. 415), the author notes the impossibility of an analysis of the problem without the simplification of spherical particles. With respect to the angle of contact between soil moisture and soil particle, he presents experimental evidence consisting of observations of the contact angle between water and the surfaces of calcite, new cleavage face of calcite, the old face cleaned with chromic acid, of like faces of orthoclase feldspar, of a cleaned quartz crystal face, of a new cleavage face of mica, and of cleaned and polished smooth faces of quartzite and limestone, together with experiments on the effects of fatty substances in approximately monomolecular films.

The angle of contact between water and the clean faces of glass and of the minerals was found to be zero or small. Foreign substances, fats and fatty acids especially, caused large contact angles, and "oleic acid films on soil particles change the capillary characteristics of the soil so markedly as to indicate that there is little of this class of substance in the soil used." It was estimated also that "experiments in an attempt to show that there is an equilibrium between a soil and a saturated water vapor, drier than complete saturation of the soil, must be run with no variation of temperature in the system of more than 0.00016° C. and must extend over an uninterrupted period of more than 100 years to absorb 1 gm. of water after the pores are 0.01 cm. in radius."

It is further noted that "at the so-called hygroscopic coefficient, even though the water vapor movement is extremely slow when measured by moisture content, the soil is far from equilibrium. Serious theoretical mistakes can be made and experimental difficulties caused by assuming equilibrium when the moisture transfer is too slow to be detected by ordinary methods."

Replaceable bases of irrigated soil, W. H. Metzger (*Soil Sci., 29 (1930), No. 4, pp. 251–260*).—The effect of the moisture content on the amounts of the calcium, magnesium, potasisum, sodium, ammonia, iron, aluminum, and manganese which could be extracted by means of 0.04 N hydrochloric acid from a Clarksville silt loam soil forms the principal subject of this communication from the Arkansas Experiment Station, the soils tested having been held (1) air-dry, (2) at a moisture content of 20 per cent, and (3) flooded for a period of 75 days. The first four horizons of an old rice soil (Crowley silt loam) were also examined in comparison with four horizons of the same type, but "never irrigated and in as near a virgin state as could be obtained."

The results are tabulated and are discussed in connection with each individual cation, no broadly general inferences being emphasized.

Effect of leaking natural gas upon the soil, C. J. Schollenberger (*Soil Sci., 29 (1930), No. 4, pp. 261–266*).—After exposure to the leakage from natural gas mains, the soil was blackened, had the acrid odor of constituents absorbed from the gas, and "a peculiar stagnant mud odor," according to the observations of the Ohio Experiment Station, and showed also a marked increase in exchangeable manganese content and an appreciable increase in exchangeable ammonia.

"This increase in the active base content of the soil causes a lowering of the H-ion concentration. The source of the exchangeable manganese is in the higher oxides, which are abundant in many soils. The effects of the gas are thought to be due to displacement of air from the soil resulting in a biological reduction under anaerobic conditions so established, and are indicated to be quite transient. The exchangeable manganese quickly reverts to the nonexchangeable form under exposure to conditions favoring oxidation, and plants grow well in the soil. Recovery of very acid soils damaged by gas would no doubt be hastened by an application of lime in addition to thorough aeration."

Soil and crop studies with ammonium sulfate, A. L. Prince and A. W. Blair (*Soil Sci., 29 (1930), No. 4, pp. 267–279, pls. 3*).—The experiments here reported from the New Jersey Experiment Stations indicated the possibility of increasing the dosage of ammonium sulfate up to the addition of 1,800 lbs. to the acre of a heavy silt loam, with "no injurious effect on barley or rape, but rather a gradual increase in the crop yield and in the percentage of nitrogen in the dry matter." The nitrogen content of the barley crop was raised to 3 per cent and that of the rape to 4 per cent. "On Sassafras sand," however, "increasing amounts of ammonium sulfate beyond 350 lbs. an acre showed marked crop injury.

"The protein content of the crops may be increased by an ample supply of nitrogenous fertilizer in the soil, but just how much excess can economically be applied to the soil is a question for each individual case and each particular type of soil."

The largest applications of ammonium sulfate had increased the acidity only to the extent of 0.6 pH either in the loam or in the sand after 1 month, but after 10 months the acidity increase was equivalent to a drop of 1.3 pH where the heaviest ammonium sulfate applications had been made on the loam soil. Similar but less marked changes appeared in the sand soil.

"The base exchange capacity of these different types of soil no doubt influences the change in H-ion concentration when different amounts of ammonium sulfate are applied. The strong buffer action of the loam soil prevents plant injury even though the H-ion concentration is increased. There was found to be a distinct correlation between the amount of 'active' aluminum found in the treated soils and their pH values. The formation of aluminum sulfate through base exchange reactions and the hydrolysis of this salt are thought to account for the increase in H-ion concentration of the soil."

Removal of ions from solutions of calcium dihydrogen phosphate by treatment with hydrous gels of alumina, silica, and their mixtures, J. C. Ghosh and P. B. Bhattacharyya (*Soil Sci., 29 (1930), No. 4, pp. 311–322, fig. 1*).—A contribution from the University of Dacca, India. The paper details voluminous data collected in experiments on the reactions and absorption taking place in the treatment of carefully purified gels of alumina and of silica and in mixtures of the two colloids with solutions of calcium dihydrogen phosphate, and presents a detailed discussion of the theoretical considerations involved.

In the case of the silica gel experiments, it is noted that "the removal of calcium and dihydrogen phosphate ions in almost equivalent proportions can be explained on the hypothesis that silica gel absorbs calcium ions by valency forces . . . and the resulting electro-positive gel removes dihydrogen phosphate ions from the solution by forces of electrical attraction." The observed effect of the alumina gel is considered explicable on the basis of the reaction:

$$Al(OH)_3+CaH_4(PO_4)_2=CaHPO_4+AlPO_4+3H_2O$$

"This at once explains the acid neutralizing action of this gel and also the removal of calcium and phosphoric anhydride in equivalent amounts and in considerable quantities from the solutions."

The nature of calcium hydroxide absorption by hydrated silica, W. M. Shaw and W. H. MacIntire (*Soil Sci., 29 (1930), No. 6, pp. 429–456, figs. 8*).—

Forming part of a study of such components of the soil as are capable of reaction with aqueous solutions of calcium hydroxide or of calcium sulfate, the investigation of the system calcium oxide-silica-water reported in this communication from the Tennessee Experiment Station included "preliminary work on the speed of calcium hydroxide absorption by silica of different origins and degrees of hydration with agitation and attrition." The inferences were drawn that the degree of hydration of amorphous silica had little effect on the speed of the calcium oxide-silica reaction, that the speed of the reaction and the rate of approach to equilibrium decrease with increase in the size of the particles of the silica gel, that continuous agitation with 0.125-in. steel balls was the most expeditious procedure for inducing maximum absorption by particles of from 35- to 200-mesh fineness, and that the abrasive action of the attrition agent on the glass containers induced more rapid calcium-silica reactions.

"The absorption of calcium hydroxide by hydrated silica was first investigated by the use of dialyzed silica hydrosol and two kinds of silica gels, which led to the development of the formula $x=2.34C^{0.1818}$, in which x represents the molar ratio calcium oxide-silica in the absorption product and C the final calcium hydroxide concentration. This formula is limited in its application to equilibrium concentrations above 0.005 N. The experiments on the reaction between calcium hydroxide and silica disclosed a series of hydrated calcium silicates of varying degree of solubility and varying calcium oxide-silica composition ratios, whose existence is governed by the total available calcium hydroxide-silica ratio and the resulting hydroxyl-ion concentration. The solubility of their respective silica contents in dilute hydrochloric acid may be used to differentiate between the 'absorption-product' and the 'solid-phase reaction product' that result from calcium hydroxide-silica reactions."

Factors affecting the estimation of lime requirement from pH values, M. F. Morgan (*Soil Sci., 29* (*1930*), *No. 3, pp. 163–180, figs. 2*).—A contribution from the Connecticut State Experiment Station, this study on the relation of reaction to lime requirement, as observed in several hundred tobacco fields in the Connecticut Valley "showed an excellent correlation between pH and lime requirement for soils of approximately the same texture and organic content. An increase in organic matter and a heavier texture both produce a larger value of the 'lime absorption factor,' which represented the amount of lime required to decrease the acidity 1 pH. An approximate table of factors was calculated which appeared to be of general application to this group of soils."

A study of the rate of change in reaction produced by calcium carbonate in quantities corresponding to ½, 1, 1½, and 2 times the Jones lime requirement on 14 of these soils showed a constant difference in the relative effectiveness of lime in these proportions. A constant factor was found to be in operation on each individual soil, determining the amount of lime required to produce a given change in pH toward the neutral point. An inspection of these data as related to the physical characteristics of these soils suggested that the value of this factor can be determined approximately from a study of the mechanical analysis, organic content, and moisture constants of the soil.

"A group of 56 soils were thus investigated. A most striking correlation between moisture equivalent and the 'calcium carbonate absorption factor' was revealed. Since the moisture equivalent is in effect a measure of the summation of the effect of differences in texture and organic content upon the absorptive properties of the soil, this result is not difficult to explain. It lends weight to the view that the lime requirement of the soil is a logarithmic function of the actual H-ion concentration and a direct function of the specific absorptive characteristics of the soil.

"Since the amount of calcium carbonate required to produce a change of 1 pH in reaction toward 7 pH can be expressed by multiplying the moisture equivalent by the factor 0.119, and since the moisture equivalents of soils of different textures and organic contents are relatively constant, a table of calcium carbonate absorption factors for the various textural classes at varying organic contents has been prepared. It has proved to be of good general application on a group of 100 random samples of soils from all parts of Connecticut, and is believed by the writer to be suitable for the estimation of lime requirement from pH values for most normal soils in the humid region of eastern United States."

Biological oxidation of sulphur, II, III (*Jour. Indian Inst. Sci., 12A* (*1929*), *No. 19, pp. 275–294, pls. 9*).—These two papers continue the record of an investigation of which the first report has been noted (E. S. R., 60, p. 122).

Part II. *Effect on the microflora of activated sludge*, C. V. R. Ayyar and R. V. Norris (pp. 275–277).—During the progress of aeration and oxidation of sulfur, there was a decrease in the number of fecal and putrefactive bacteria and of chromogenic organisms. At a later stage, further specialization took place and only a few well-defined soil types persisted. When the pH had reached about 5.2, Actinomyces were the predominating organisms, dying out at a reaction between 3 and 4, when molds appeared in large numbers. The latter survived until the pH was about 2.1, Fusarium being usually the most resistant type. At this last stage, the sulfur-oxidizing organisms began to multiply vigorously. They were almost the sole survivors and continued to increase actively.

"Owing to the absence of nearly all other organisms, it was then easy to isolate the sulfur-oxidizing organisms in pure culture."

Part III. *A sulphur-oxidising organism from activated sludge*, C. V. R. Ayyar (pp. 278–294).—From material of which the decomposition had reached the stage noted in the previous paper at which, the pH value having dropped to 2.1, the sulfur-oxidizing organisms constituted practically the only surviving microflora, the author isolated the organism which "develops on washed agar, silica jelly, and gypsum blocks presenting both normal and involution forms. The characteristics and cultural behavior are different from those observed by Joffe and coworkers [E. S. R., 47, p. 621]. It withstands pH 6.6 and can utilize carbohydrates to some extent, oxidizing more sulfur in their presence. Certain inorganic salts also have a favorable effect, the influence of sodium silicate being very marked."

An air current disturbing the culture was found to retard the sulfur oxidation process. Vegetable and animal charcoals made the oxidation more rapid. The sulfur-carbon ratio of the organism was determined as 40.75, that isolated by Joffe (reference above noted) having shown the corresponding figure 31.8. "Thus the organism is much more economical in the utilization of energy."

In conclusion it is stated that "peculiarities in the morphological and physiological behavior, the higher sulfur-carbon ratio, and other similar considerations afford data sufficient to classify the organism as a new species, capable of oxidizing elemental sulfur to sulfuric acid and not accumulating sulfur within or without the cells."

AGRICULTURAL BOTANY

Cell-sap concentration and transpiration as related to age and development of cotton leaves, F. M. Eaton (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 9, pp. 791–803, figs. 5*).—The interrelations between the concentration of cell sap and the rate of transpiration of cotton leaves as influenced by age and the relation of these factors to leaf development were studied in Pima Egyptian cotton grown at Sacaton, Ariz., in 1927. The sap concentrations and the temperatures were measured on leaves varying in average age from 82 to 3 days and located at successively higher nodes of the main stalks of plants grown without branches or bolls.

The freezing point depressions of the expressed sap decreased from 1.57° C. for leaves 74 days old to 1.1° for leaves 10 days old, while the specific electrical conductivities of the same saps rose from 0.0316 reciprocal ohms for leaves 82 days old to 0.0337 for those 62 days old and then decreased to 0.0288 for leaves 20 days old.

The young leaves were found to be cooler than old ones, e. g., the temperature of leaves 82 days old was 2.3° below that of the air, whereas leaves 26 and 20 days old were 4.1° below. The temperature of leaves 3 days old was about the same as of those 82 days old. The coefficient of correlation between the temperature and the sap concentration of leaves from 82 to 20 days old was —0.92±0.035 for the freezing point and —0.86±0.061 for conductivity. Reference is made to an earlier report (E. S. R., 61, p. 30) in which it was shown that the differences in the temperatures of cotton leaves with different transpiration rates were inversely proportional to the transpiration differences.

Plants defoliated for the leaf-sap measurements subsequently developed leaves of a more mesophytic character and of about three times greater size than the coincident leaves on plants treated similarly but not defoliated. The leaf-temperature and sap-concentration measurements seemed to furnish an explanation of the stimulated leaf development on the basis of differences in the water relations of the new leaves on the two sets of plants. Young leaves of the cotton plants with their low sap concentration were less able than the old leaves to obtain water from the transpiration stream, and their higher rate of transpiration served to increase their requirements per unit of area.

Researches on the changes in the opening of the stomata which occur in different species of Citrus, J. D. Oppenheim (*Zion. Organ. Agr. Expt. Sta., Agr. Rec., 1 (1927), No. 1, pp. 9–39, pls. 4*).—The data are tabulated, with conclusions in detail and discussion thereof, which were obtained as to changes in stomatal aperture during the day from a study carried out in the summer of 1925 by the use of the porometer on *C. bigaradia* and *C. limmetta*, employed as stocks in the cultivation of the sweet orange (Jaffa orange, called locally Shamuti).

It was found that the numbers of the stomata, supposedly to some extent hereditary, vary considerably and fail to provide a satisfactory explanation of the differences indicated.

May water loss from plants be reduced by foliage sprays? F. B. Cross (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *7 (1927), pp. 129–131*).—Starting with the claim that milk applied as a spray had been found to lessen the water loss from plants, the author separated milk into butterfat, casein, albumen, and salts, and determined that it was the butterfat that reduced the water loss. Milk constituents and oils were also used separately in tests with Jerusalem cherry (*Solanum capsicastrum*), *Cineraria* sp., apple (*Pyrus malus*), and crab apple (*P. baccata* × *P. malus*), all of this work being done in the greenhouse with impervious pots sealed over according to a procedure which is outlined.

The percentages of water loss by each species of plant after being sprayed, as compared with that of the unsprayed controls in that species, are tabulated. It is shown that milk, cream, Wesson oil emulsion, cotton oil emulsion, corn oil emulsion, mineral oil emulsion, Bordeaux oil emulsion, and Volck (miscible oil) gave negative percentages of loss, ranging from —13.2 per cent for 1 per cent Bordeaux oil emulsion to —42.3 per cent for 38 per cent cream and —44 per cent for 1 per cent cotton oil emulsion. Milk without fat gave a positive loss of +6 per cent, and Bordeaux mixture 5-5-50 a positive loss of +3.9 per cent, all other applications to all plants showing deficits of loss, or negative loss, as compared with the controls.

Direct stimulation of growth processes [trans. title], A. NIETHAMMER (*Zellstimulationsforsch., 3 (1928), No. 2, pp. 111-114*).—In tests regarding direct stimulation of growth phenomena, employing a Saprolegnia isolated from dead flies, it was found that zinc sulfate at from 0.0001 to 0.0005 per cent supplied stimulation resulting in an increased rapidity of growth, but that no such increase of growth rate was produced by the stimulant thyreoidea. Results of other tests are briefly detailed.

Stimulation of seeds with dry media [trans. title], M. POPOFF and H. MAGNUS VON MERKATZ (*Zellstimulationsforsch., 3 (1928), No. 2, pp. 125-137, figs. 3*).—Emphasizing the view of Popoff that the fundamental property of a stimulating medium is its capability to activate the oxidation processes in the living substance and as a consequence to stimulate, to carry above the normal, the "global phenomena" of life, the authors state that studies to test for such effects of certain substances have been inaugurated. They offer a detailed account, with data showing the effects obtained in some such work as applied to seeds of wheat, rye, and beet, subjected in pots or in the field to the influence of salts of potassium, magnesium, and sodium, with infusorial earth.

✓ **Stimulation studies with rice seeds** [trans. title], S. KONZULOFF (*Zellstimulationsforsch., 3 (1928), No. 2, pp. 115-124, figs. 3*).—Methods of study and data are detailed, with a general account of irregular series, poisons as stimulants, and the effects on growth of small amounts of stimulating or ordinarily poisonous substances when used on rice seeds.

The question of the stimulating effect of carbolineum in horticulture [trans. title], W. GLEISBERG (*Zellstimulationsforsch., 3 (1928), No. 2, pp. 139-150, fig. 1*).—Noting an account by Houben and Hilgendorff (E. S. R., 57, p. 358) regarding the effects of carbolineum on the growth of normal or of mechanically wounded plants, and presenting other data, the author states that the effects of carbolineum vary with different species of pear, sometimes retarding development or even causing necrotic injuries which occasionally lead to the death of the spring buds. In almost all varieties the later developments included the production in variable amounts of adventitious buds. This is considered a secondary effect, resulting from growth check or from wound stimulation. It is concluded that carbolineum is not to be looked to as a practical horticultural agent for producing stimulation.

The temporary depression of life processes [trans. title], M. POPOFF, G. PASPALEFF, and M. DOBREFF (*Zellstimulationsforsch., 3 (1928), No. 2, pp. 157-162*).—Cell stimulating media have the fundamental property of increasing the rate of the oxidation process in living matter and thereby of activating the integral phenomenon of life and of carrying it above a former level. The possible inverse effect had been sought in experimentation which has been projected, and some results from this are thought to be potentially valuable in the interpretation of stimulation phenomena.

Electricity and plant growth [trans. title], W. RIEDE (*Gartenbauwissenschaft, 1 (1928), No. 4, pp. 403-462*).—This is chiefly a discussion of the significance of electricity for horticulture.

The cultivation of plants under electric light [trans. title], A. NIETHAMMER (*Zellstimulationsforsch., 3 (1928), No. 2, pp. 151-155*).—A brief statement is given of the results from a study on the question as to the possibilities and economy of rearing useful or ornamental plants under electric illumination.

The advantage from raising vegetables under electric lighting is generally small or negative. That from forcing flowers may be very favorable, on account of qualitative considerations, especially coloration, and on account of the saving in heating expense.

A result of scientific interest is the success attained in carrying the rearing of plants from seeding to seed ripening under artificial illumination.

Bioelectric phenomena in relation to growth in plants [trans. title], S. Colla (*Nuovo Gior. Bot. Ital., n. ser., 34 (1928), No. 5, pp. 1281–1295, figs. 5*).—In young cereal plantlets during growth, differences of electrical potential exist between the growing point and the collar, with a current moving always toward the roots and presenting a diurnal and a nocturnal maximum with contemporaneous variations in the resistance of the media. The electrical phenomena are interpreted.

Influence of temperature on response to electrical stimulation, H. H. Dixon and T. A. Bennet-Clark (*Roy. Dublin Soc. Sci. Proc., n. ser., 19 (1928), No. 4, pp. 27–38, figs. 8*).—A discussion is given of the evidence basing the view that the electrical conductivity of a tissue is due largely to the permeability to ions of the protoplasmic membranes of the component cells, and that a change in conductivity is due to a change in the permeability of the protoplasts and proportional to such a change. Reference is made to indications reported by Dixon (E. S. R., 54, p. 627), and by both authors (E. S. R., 58, p. 422). A further study is described of the effects on permeability (conductivity) due to the passing of alternating currents through tissues. It is claimed that between November and March the sensitivity of the leaf of *Hedera helix* to electric stimuli varies over a wide range. It is shown that temperature has a much more marked effect on the magnitude of a response than has been supposed, and that this effect is possibly rendered complex by the relative independence of the positive and negative responses. Between 20 and 35° C. a change of 1° may alter the magnitude of the response by 10 per cent. The effect of temperature on the conductivity is described, and the question of the relation between the energy supplied to the tissue and the magnitude of the response is briefly discussed.

Forcing plant growth with hydrocyanic acid gas [trans. title], G. Gassner and H. Rabien (*Gartenbauwissenschaft, 1 (1928), No. 4, pp. 385–402, figs. 9*).—Following up work done or participated in by Gassner (E. S. R., 57, pp. 321, 416, 831), the authors detail the varied results of trials with hydrocyanic acid gas supplied to *Convallaria majalis*, *Tulipa gesneriana*, *Hyacinthus orientalis*, *Iris pumila*, *Fagus sylvatica*, *Deutzia gracilis*, *Hydrangea paniculata*, *Syringa vulgaris*, *Carpinus betulus*, *Dicentra spectabilis*, *Astilbe japonica*, *Cydonia japonica*, *Rosa* sp., *Tilia parvifolia*, *Tamarix tetrandra*, *Viola odorata*, *Fraxinus excelsior*, *Phlox canadensis*, *Viburnum lantana*, *Aster alpinus*, and *Doronicum caucasicum*.

The administration of carbon to plants via the leaves [trans. title], L. Montemartini (*Ann. R. Accad. Agr. Torino, 70 (1927), pp 3–15*).—The results as summarized of experimentation with different plants were on the whole somewhat in favor of the possibility of causing the plants to utilize an additional supply of carbon dioxide.

Some effects of potassium deficiency on the histological structure and nitrogenous and carbohydrate constituents of plants, G. T. Nightingale, L. G. Schermerhorn, and W. R. Robbins (*New Jersey Stas. Bul. 499 (1930), pp. 36, figs. 4*).—Working largely with Bonny Best tomato plants grown in plus- and minus-potassium nutrient cultures, the authors observed that externally the lack of potassium affected the plants in much the same way as did the lack of nitrogen. The first conspicuous symptoms were the development of a stiff woody stem and of yellowish green leaves with purple veins and the early setting of fruit. Internally there was a marked accumulation of carbohydrates and the formation of thick cell walls in the xylem, phloem, and mechanical tissue. There was no difference between the plus- and minus-potassium tomato plants as to concentration of nitrates. However, when the external nitrate supply was withheld, the plus-potassium plants quickly assimilated all the nitrates in their tissue, while the minus-potassium plants maintained a high concentration of nitrates until death, suggesting that potassium is essential for the synthesis of organic nitrogen from nitrates. The comparative abundance of nitrites following the application of potassium to minus-potassium plants is deemed to indicate that potassium is specifically necessary for initiating nitrate assimilation.

Finding the protein fraction to be about the same in the plus- and minus-potassium plants, the authors conclude that potassium is not directly essential for the later stages in synthesis of storage proteins, since the percentage of total protein may be comparatively high in potassium-deficient plants which invariably have a low proportion of meristematic tissue.

It was observed that most of the potassium in the plant is water soluble. When present in limited amount, it is translocated freely from mature tissue to regions of active cell division, where its presence was evidently needed for mitosis, no meristematic tissue being found which did not contain an abundance of potassium.

Minus-potassium plants increased considerably in length but little in diameter, the activity of the cambium being apparently inhibited. Lack of potassium also limited the development of cork cambium or the initial embryonic layer of the abscission zone. During the last stages of minus-potassium treatment many of the leaves and fruits failed to abscise. Potassium-deficient plants died prematurely if bearing fruit, the limited potassium supply being translocated to the fruit at the expense of the growing tip. Death of the tip was followed shortly by the death of the entire plant.

Skin and starch characters of potatoes, R. Thor (*Untersuchungen über Schale- und Stärkeeigenschaften der Kartoffel. Inaug. Diss., Georg-August Univ., Göttingen, 1926, pp. 48, pls. 8*).—This is a University of Göttingen thesis.

Biology of fruits and seeds (carpobiology), E. Ulbrich (*Biologie der Früchte und Samen (Karpobiologie). Berlin: J. Springer, 1928, pp. VIII+230, figs. 51*).—Both the general and the special part of this book deal somewhat largely with the problems and successes of plants as regards distribution.

GENETICS

Cytological and genetical studies with petunia [trans. title], W. Riede (*Gartenbauwissenschaft, 3 (1930), No. 3, pp. 185–200, figs. 14*).—The basic number of chromosomes in petunia was found to be seven, with various aberrant forms possessing certain multiples thereof. That crossing is beneficial in the petunia was shown in much stronger progeny plants from crossing than from selfing of the same mother plant. Petunia pollen induced parthenocarpy and in rare cases parthenogenesis in Nicotiana, with no such response in the opposite direction.

√**Shrivelled endosperm in species crosses in wheat, its cytological causes, and genetical effects,** W. P. Thompson (*Genetics, 15 (1930), No. 2, pp. 99–113, figs. 7*).—In crosses between 14- and 21-chromosome wheats the F_1 grains are plump when the 21-chromosome species is female and wrinkled when it is male. In the former case the endosperm of the seed is diploid with respect to the extra 7 *Triticum vulgare* chromosomes, and haploid in the latter. In backcrosses of F_1 with *T. vulgare* most seeds are plump when *T. vulgare* is female, though wrinkled ones occur, while in the reciprocal nearly all are wrinkled or badly shriveled. In back-crosses with emmers also the seeds are better when the pure parent is female.

The chromosome numbers of many back-cross plants produced by different kinds of seeds (plump, wrinkled, shriveled, large, small) were determined at the University of Saskatchewan. It was observed that the endosperm is plump and large when it contains none or few of the extra 7 vulgare chromosomes, or 3 sets of 7, complete or nearly so; is usually plump and small when it contains 2 sets, complete or nearly so; and wrinkled or shriveled when it is haploid for all or many of the 7, or diploid or triploid for some only. The shriveling is severe as the chromosome situation departs farther from the complete absence or complete diploidy or triploidy of the *T. vulgare* chromosomes.

"Endosperm conditions, depending in this way on chromosome conditions, play a large part in the nonappearance of many types in F_2 and later generations of ordinary crosses. The missing plants would have such chromosome conditions that the endosperm of the seeds from which they would have to develop would be badly shriveled (or absent).

"In genetic analysis and economic work on such crosses special care in selection and culture should be given to shriveled seeds, since they represent cytological and genetical types not found among the plump ones."

The effect of a single gene upon development in the heterozygote in sorghum, R. E. Karper (*Jour. Heredity, 21 (1930), No. 4, pp. 187–192, fig. 1*).—This gives a more detailed account of a study of the effect of albinism in sorghum when present in the heterozygote, noted on page 435.

Inheritance of certain seed-coat colors in soybeans, R. T. Stewart (*Jour. Agr. Research* [*U. S.*], *40 (1930), No. 9, pp. 829–854*).—The inheritance of yellow, black, imperfect-black, light-brown, reddish-brown, and buff colors in the seed coat of soybeans was studied into the F_2 and F_3 generations of crosses between several varieties at the Iowa State College.

Indications were that two complementary factors, R_1 and R_2, suggested by Owen (E. S. R., 58, p. 424), cause the development of black pigment, and it was observed that with R_1r_2 the color is a dilute or imperfect black, with r_1R_2 the pigment color is light brown, and with r_1r_2 the color is buff. A series of allelomorphs, R_1r_1 and r_1^o, was found to exist at the R_1 locus. R_1 with R_2 produces black pigment, r_1 with R_2 light brown, and r_1^o with R_2 a reddish-brown color. Two pigment restriction factors, I and I^k, appeared to form an allelomorphic series with i. I restricts any of the pigment colors to the hilum or regions around the hilum. I^k restricts pigments so as to give the eyebrow pattern, whereas i has no inhibiting effect and when homozygous the seeds are self-colored. The author considers that the factor R_2 if not the same as T for tawny pubescence is closely linked therewith. Crossing over between the two factors was not observed in these studies.

Linkage studies with "slashed" and "glossy$_1$" of the Bn linkage group in maize, H. E. Brewbaker (*Jour. Agr. Research* [*U. S.*], *40 (1930), No. 10, pp. 939–950, figs. 2*).—A seedling and plant character, "slashed," was obtained at the Minnesota Experiment Station as a segregate from several selfed lines of Minnesota No. 13 yellow dent corn. Its appearance was characterized by long, thin, chlorophyll-deficient striae on each leaf of the plant, usually in greater abundance near the tip. These thin spots broke through in later stages of plant development and gave the leaf a slashed appearance. Slashed appeared to be a simple recessive, and the factor pair concerned was designated *Sl sl*.

Slashed seemed to be independent in inheritance from *Pr pr* and from factors in each of the eight well-known linkage groups except the *Bn* group. The independence of *sl* and other members of the *Bn* group from other linkage groups was further verified by F_2 linkage studies of gl_1 in relation to factors in the *C*, *R*, *su*, *Y*, *P*, and *A* groups, in which independent inheritance was indicated in every case. In studies of the linkage relations of *sl* with gl_1, *ra*, and *Bn* of the *Bn* group with F_2 material the crossover values obtained by Yule's coefficient of association method were *sl* v. gl_1 16.3±1, *sl* v. *ra* 21±1.4, and *sl* v. *Bn* 15.7±1.5. Considered in relation to the data reported by Kvakan (E. S. R., 52, p. 727) the order of the genes appears to be *ra*—gl_1—*sl*—*Bn*. These results further support those of an earlier investigation in indicating that the *Bn* linkage group is independent of other groups.

Investigation of a theory of linkage, K. von Körösy (*Versuch einer Theorie der Genkoppelung. Leipzig: Borntraeger Bros., 1929, pp. XII+272, figs. 47*).—A theory of gene linkage is presented, giving special atention to nonlinear linkage.

Inheritance in Brahman and Hereford cattle (*Texas Sta. Rpt. 1929, pp. 32, 33*).—Further study of the characteristics of crossbred Hereford-Brahman cattle has led to the conclusions that (1) Brahman blood makes for adaptation to pasture conditions, particularly at the lower altitudes and where insect pests are worst; (2) the Brahman grades do better than is generally believed when placed on full feed, but they do not often make as large gains as Herefords or Shorthorns; and (3) at the packing plants the Brahman grades show high dressing percentages, but the carcasses are less desirable. There is evidence that various contrasting characteristics in the Hereford and Brahman, such as color, conformation, disposition, and voice, are inherited in a Mendelian manner, though the number of factors responsible has not been determined.

Studies on the inheritance of coat colors in crosses involving Philippine native with Hereford and Nellore cattle.—Preliminary report, M. Manresa, B. M. Gonzalez, F. B. Sarao, and J. P. Esguerra (*Philippine Agr., 18 (1930), No. 9, pp. 521–533*).—Studies of color inheritance in crosses between Hereford and Nellore, Nellore and native, and Hereford and native cattle indicated that the Nellore cattle and the native Philippine cattle carry the factor for black and a dominant factor which dilutes black and red to dun and yellow. A factor, *A*, for silver gray, is carried by the Nellore breed. When homozygous this characteristic is completely epistatic to black and red, but when heterozygous partial expression of these colors is permitted. Brindling in cattle is due to a dominant factor. This may be carried by Herefords without expression, since the breed does not carry black.

The Dopa reaction in different color races of guinea pigs and rabbits [trans. title], F. Kröning (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 121 (1930), No. 3, pp. 470–484, figs. 6*).—Studies of the Dopa reaction in the skin of guinea pigs showed that it was strong in the presence of the genes C, c^a, c^H, and P, but was weak in *pp* individuals. The reaction was independent of the presence of genes of the extension series. The factor *P* determines the presence of a ferment which may produce melanin from an aqueous solution of dioxyphenylalanine. The chromogen is present when the gene *E* is present. Similar results were obtained in parallel experiments with rabbits.

The nature of racial and sexual dimorphism in the plumage of Campines and Leghorns, C. H. Danforth (*Biol. Gen., 6 (1930), No. 1, pp. 99–108, pls. 5*).—Studies of the type of feathering on skin grafts transferred reciprocally between hen-feathered Campine-Leghorn hybrids and Leghorns of both sexes indicated that "the Campine and the Leghorn differ from each other both in the type of feather-stimulating (or 'inhibiting') endocrines which they produce and in the responsiveness of their respective feather follicles to those endocrines."

The genetic differences between fully cock-feathered and fully hen-feathered races are considered to require the operation of two genetic genes. One factor is hormonal in character and may be designated by *H*. The other factor, *F*, determines the responsiveness of the follicles to the endocrine stimulation. Both are apparently dominant in the hen-feathered group.

In skin transplants between birds of different sexes but of the same genetic constitution the feather character is that of the host. When the genetic constitution differs, the developing feathers are in general characteristic of the feathers for the sex of the host and the breed of the donor. This also applies to transplants in gonadectomized birds.

The determination of the secondary sexual characteristics of the domestic cock: Physiological and histological study [trans. title], J. Benoit (*Arch. Zool. Expt. et Gén., 69 (1929), No. 4, pp. 217–499, pls. 5, figs. 106*).—A detailed study of the influence of the endocrine secretions of the sexual glands on the secondary sexual characters in the male fowl is reported. The study appears to point toward a quantitative influence of the sex hormone as contrasted with the all or none hypothesis. It appears that the seat of the testicular hormone lies in the interstitial cells, though there is some evidence of a complementary influence of the cells of the germinal epithelium.

Seminal-vesicle and prostate function as a testis-hormone indicator.—The electric ejaculation test, C. R. Moore and T. F. Gallagher (*Amer. Jour. Anat., 45 (1930), No. 1, pp. 39–69, fig. 1*).—A description is given of the electric ejaculation hormone test in the guinea pig, previously referred to (E. S. R., 62, p. 824), together with data on the weights of successive and seasonal ejaculations of normal males, castrated males, and castrated males treated with lipoid extracts of bull testicles.

Rat-prostate cytology as a testis-hormone indicator and the prevention of castration changes by testis-extract injections, C. R. Moore, D. Price, and T. F. Gallagher (*Amer. Jour. Anat., 45 (1930), No. 1, pp. 71–107, pls. 4*).—The histological structure of the three lobes of the prostate gland of normal and castrated rats is described. Castration effects which involve secretory-cell involution in the anterior lobe; acinus shrinkage, stromal increase, and loss of light areas from secretory cells in the middle and posterior lobes, as well as Golgi-body regression in all three lobes, may be detected within five days after testis removal. The administration of lipoid extracts of bull testes may result in the restoration of approximately normal conditions in castrated animals (E. S. R., 62, p. 824).

Rat seminal-vesicle cytology as a testis-hormone indicator and the prevention of castration changes by testis-extract injection, C. R. Moore, W. Hughes, and T. F. Gallagher (*Amer. Jour. Anat., 45 (1930), No. 1, pp. 109–135, pls. 2*).—Castration of the white rat produces changes in the histological structure of the seminal vesicles, involving a loss of secretion granules within two or three days, progressive involution of the secretory epithelium, and severe reduction in the Golgi apparatus. Changes increase over a period of about 20 days after castration. These changes may be prevented by injections of the testis hormone as contained in lipoid extracts of bull testes. The changes furnish the basis for the seminal vesicle test for the male hormone, previously noted (E. S. R., 62, p. 824).

Observations on ovulation in the rabbit, A. Walton and J. Hammond (*Brit. Jour. Expt. Biol., 6 (1928), No. 2, pp. 190–204, pl. 1, fig. 1*).—Observations of ovulation in the anesthetized rabbit indicated that some follicles rupture beginning about ten hours after coitus, but all do not rupture simultaneously. As the follicle matures there is increased vascularity, with rapid distension resulting from marked secretory activity, which causes it to rupture. Corpora lutea were not formed when follicles were ruptured artificially, either with or without mechanical stimulation of the uterus. The blood follicles formed from artificially ruptured follicles did not inhibit compensatory growth of follicles in the ovaries.

The functions of the corpus luteum, I–III, A. S. Parkes (*Roy. Soc. [London], Proc., Ser. B, 104 (1929), No. B 729, pp. 171–182, pls. 3; 183–188, pl. 1; 189–197, pls. 5*).—The first of these papers deals with the mechanism of oestrum inhibition, the results of tests indicating that the corpus luteum or luteal tissue in the ovary is the seat of an oestrum-inhibiting substance. Examination of the ovaries in a few female mice in which sterile matings were not followed by the prolonged pseudopregnancy period showed that corpora lutea were not present. Sterilization by X-rays of the ovaries of normal females gave somewhat irregular results, as it appeared that mating with sterile bucks stimulated luteinization in the sterilized ovary, thus inhibiting oestrum. When the corpora lutea were removed during lactation, much less oestrin was required to produce oestrum than in the presence of the corpora lutea. Injections of sodium hydroxide extracts of the anterior pituitary stimulated luteinization of the ovary in normal and X-ray-sterilized mice. The developing luteal tissue had an inhibiting influence on oestrum.

In the second paper it is pointed out that in the albino mouse placentomata formation occurred during pseudopregnancy and during lactation, but could not be induced in the unmated female. Placentomata were, however, produced during the dioestrous cycle in normal females after injection of sodium hydroxide extracts of anterior pituitary. These results and other findings appeared to indicate quite conclusively that the corpus luteum produces a substance responsible for the preparation of the uterus for the formation of placentomata.

In the third study it was shown that the mammary proliferation which accompanies the first half of pregnancy in the rabbit also occurred during pseudopregnancy. By continuing the duration of pseudopregnancy by pituitary extracts which stimulate lutein formation in the ovary, it was possible to bring about a proliferation of the mammary gland comparable with that found during normal pregnancy, thus indicating that the corpus luteum produces a substance responsible for the development of the mammary gland.

FIELD CROPS

[Field crops experiments at the Tribune, Kans., Substation], T. B. Stinson and H. H. Laude (*Kansas Sta. Bul. 250 (1930), pp. 10–36, figs. 12*).—Varietal leaders in tests over various periods since 1912 included Dwarf Yellow milo, Sunrise and Dawn kafir, and feterita of the grain sorghums; Kansas Orange, Red Amber, and Early Sumac sorgos and Sunrise kafir for forage; Cassel White and Freed White dents and Blue Squaw corn; Kanred winter wheat; Prelude and Kubanka spring wheat; Stavropol barley; Kanota oats; Pinto beans; Blackeye and Early Buff cowpeas; Irish Cobbler and Red River Ohio potatoes; and buffalo grass for lawns. Cultural practices are given briefly for most of the above crops, and trees and flowers for ornamental plantings and adapted fruits and vegetables are indicated.

The advisability of growing both corn and sorghum was evident. The best corn varieties outyielded adapted sorghums over 8 years, yet sorghum was more drought resistant and yielded more forage, the quality of kafir and sorgo forage surpassing that of corn. Among the small grains winter wheat has been the best cash crop and barley the best feed crop. Winter wheat tests over an extended period showed that profitable crops are had in about one-third of the seasons, marginal crops in one-third, and low yields or failures in one-third.

Manure applied at rates of 5 and 10 tons per acre before the sorgo in a 5-year rotation of sorgo, milo, fallow, barley, and corn resulted in increased yields of sorgo, corn, and milo. Barley on the summer fallow yielded slightly less on the manured than on the untreated land. The larger increases after the 5-ton rate suggested the desirability of light applications in regions deficient in rain. Barley yielded 51 per cent more on fallowed land than on cornstalk land, oats 97 per cent more, and spring wheat 94 per cent more. Winter wheat on fallow produced 23 per cent more than after corn.

The various cultural tests indicated May 16 to 31 for planting sorghums for grain and June 1 to 10 for forage and furrow drilling 3 pk. of seed around September 1 for winter wheat and about 45 lbs. per acre March 15 for small grains. The common drill was preferable to the furrow drill in seeding Sudan grass for hay, and Sudan grass after fallow considerably outyielded that after Sudan grass.

[Agronomic experiments in New Mexico] (*New Mexico Sta. Rpt. 1929, pp. 14–21, 25–29, 42, 43, 55–57, 59, 63–66, fig. 1*).—Turkey No. 60 and Kanred wheat, Gray Winter oats, and G-2.518 barley of the fall-sown grains, Early Baart wheat, Kanota oats, and Colsess and Hanna barleys of the spring-sown cereals, Mexican June and Bloody Butcher corn, Acala cotton, Smooth Peruvian alfalfa, spring vetch for green manure, and Nancy Hall and Porto Rico sweetpotatoes were outstanding in continued variety tests (E. S. R., 61, p. 219). Varietal trials with corn, grain sorghum, sorgo, millet, spring wheat, oats, beans, alfalfa, and annual legumes for hay are reported on from experimental fields in northeastern New Mexico and variety and irrigation tests with potatoes at Deming, Las Vegas, and State College. Control measures for Johnson grass, an alfalfa fertilizer test, cotton improvement work, and conditions favoring the germination and growth of chamiza (*Atriplex canescens*), winter fat (*Eurotia lanata*), and *Valota saccharata* are described briefly, and analyses of samples of winter fat and *V. saccharata* are tabulated. The behavior of various range grasses, legumes, and other plants is also touched on.

Annually-produced sugar beet seed has yielded highest from late August or September plantings. In 1929 plantings with the grain drill at the rate of 60 lbs. per acre gave highest yields and was followed by 18 lbs. of seed drilled with the beet drill and left unthinned. The results agree with those of previous years in that the thicker plantings have usually given heavier yields, and that when beets are spaced 12 in. or wider the yields are nearly always reduced. The curly top disease appeared to be one of the primary factors favoring thick plantings. The yield and sugar contents of sugar beets treated with manure and superphosphate at Las Vegas are tabulated.

The topping of cotton did not appear to be a profitable practice. On a heavy adobe soil it paid to space the plants regardless of the method used. Cotton fertilized on a rather sandy field returned highest yields from application of 300 lbs. of superphosphate and 300 lbs. of cottonseed meal.

Nicotiana rustica grown primarily for nicotine production was almost completely destroyed by a stalk-boring beetle as in two preceding years. Analyses of tobacco grown at the station indicated that the commercial varieties are not suitable in quality for market demands. It is believed that the outlook for tobacco as a crop for New Mexico is not favorable.

Analyses of 89 samples from 8 counties showed wheat of the 1928 crop grown under irrigation to range from 9.27 to 13.44 per cent in protein, averaging 11.62, and grown on dry farms from 11.13 to 16.99 per cent, averaging 14.43. In general the protein percentage increased and the yield decreased with the smaller amounts of rainfall. The maximum protein content of about 17 per cent was found in samples where the yield was lowest, 8 bu. per acre. The moisture of wheat samples was between 9 and 10 per cent.

Sugarcane variety work at the test fields, C. B. GOUAUX (*Louisiana Stas. Bul. 211 (1930), pp. 36*).—The results of continued comparisons with sugarcane varieties and seedlings (E. S. R., 61, p. 636), already noted from another source (E. S. R., 63, p. 330), are described in detail, and the relative merits of outstanding canes are appraised.

From the average sugar yield per ton and per acre in 1929 of the released plant canes, the ranking was P. O. J. 234, P. O. J. 36-M, P. O. J. 213, and P. O. J. 36. Of the new plant cane varieties C. P. 807 was excellent in all parts of the cane belt, while Co. 281 did better in the alluvial soils. P. O. J. 2725 outranked P. O. J. 36 and P. O. J. 213 in field tonnage and sugar yields per acre, although tending to be late in maturity. Plant cane averages during 3 years show P. O. J. 234 to lead as to yield of sugar per ton.

[Field crops experiments in Texas] (*Texas Sta. Rpt. 1929, pp. 48–50, 53, 54, 55, 56–62, 63, 99, 100, 104–106, 108, 109, 110, 111, 112, 113, 118, 119–121, 123, 125, 126, 130, 132, 133, 135–138, 145, 149, 150*).—Continued investigations (E. S. R., 62, p. 626) reported on from the station and substations included variety tests with corn, wheat, oats, rice, grain sorghum, sorgo, broomcorn, sugar beets, peanuts, soybeans, cowpeas, alfalfa, sweetclover, lespedeza, winter peas, vetch, sugarcane, and miscellaneous grasses and legumes; breeding work with wheat, oats, barley, corn, grain sorghum, sorgo, and peanuts; inheritance studies with corn and grain sorghum; cultural (including planting) tests with corn, grain sorghum, sorgo, broomcorn, and peanuts; comparison of grain sorghums and corn; fertilizer trials with crops in rotation, cotton, corn, wheat, oats, rice, and grain sorghums; seed treatment of sorghum; weed control; and crop rotations.

During 14 years at Lubbock the largest yields of cotton and feterita were made in cropping systems including manure, whereas neither green manures nor fallowing has been profitable. Results at Lubbock and Spur indicated that the alternate cropping of cotton and grain sorghum is probably the most practicable cropping system for the region. While the use of available farm manure and crop residues is indicated, the growing of crops merely for soil improvement has not been profitable.

Cultural tests with cotton, corn, and grain sorghum in several localities since 1918 indicated that the main value of cultivation is the destruction of weeds, which compete with the crop for plant food and moisture, and that cultivation sufficient to keep down weeds is the best kind of tillage. In similar tests at the station, cotton making the largest acre yield, 594 lbs. of lint, had received three cultivations, and the yield decreased somewhat with additional cultivation. Plats not cultivated with weeds growing undisturbed produced only 42 lbs. of lint, as compared with 520 lbs. from plats uncultivated but with the weeds hoed off. Medium to late preparation of the seed bed to a medium depth has given the most profitable results in experiments since 1918 at Lubbock and Chillicothe. At Chillicothe land plowed in July produced larger yields of wheat than land plowed in September.

Ten group measurements in a study of the effect of albinism in sorghum, when present in the heterozygote, showed no significant difference between pure green plants and those carrying a factor in a heterozygous condition for albinism. The homozygous (*WW*) green plants and the heterozygous (*Ww*) plants carrying albinism differed only in this single factor. When all other factors are constant this single lethal gene evidently does not affect the development of the heterozygote. A chlorophyll-deficient chimera found in Blackhull kafir, which produced pure green, striped yellow and green, and pure yellow seedlings, was not a Mendelian character occurring at random on the head, but the seed producing various colored seedlings were confined to definite areas on the panicle. Similar chimeras were found in milo, feterita, and hegari.

Strains of a kafir-milo hybrid that were highly sterile were found to be constant with 10 pairs of chromosomes. An examination of spikelets in these strains indicated that the sterility probably was due to physical causes, i. e., the outer glume overlapping and clasping the inner glume so that the flower was prevented from opening. The stigmas were seldom exposed to fertilization; the anthers were held within the flower and normal dehiscence prevented. Chromosome counts showed 10 pairs of chromosomes in each of 22 sorghum varieties, excepting one plant of dwarf yellow milo in which the numbers of 10, 11, and 12 were found in pollen mother cells from the same plant. Johnson grass (*Andropogon halepensis*) and Angleton grass (*A. annulatus*) were found to have 20 chromosomes.

In a study of the inheritance of head characters in crosses between two line-bred strains of kafir, classification of F_2 generation data on the basis of the means and standard deviations of the characters showed that length of rachis, number of nodes to the head, and number of seed branches are simple Mendelian in inheritance.

At least 15 Mendelian factors were found to be involved in the inheritance of premature germination in corn. Part of these were complementary in effect, producing such ratios as 3:1, 9:7, and 27:37, whereas others were supplementary factors producing ratios of 15:1, 63:1, and 255:1. When both types occurred in the same population such ratios as 45:19 and 125:131 were found.

Another stock was found in which the segregation of sugary endosperm was abnormal and in which the percentage of sugary seeds ranged from considerably less than 25 per cent to 75 per cent. Self-pollination in this stock, as well as reciprocal back crosses with homozygous sugary, indicated that the situation resembled that in the stock reported earlier. Cytological studies of many plants of the original stock revealed no relation between the chromosome number and the aberrant segregation of sugary endosperm. A new character apparently allelomorphic to sugary endosperm, found in several selfed lines of Surcropper, resembled sugary endosperm but the recessive seeds were somewhat more opaque. It was partly dominant to sugary, the degree of dominance depending on whether sugary served as the male or female parent. When 20 different stocks of "golden," a character identified by a marked yellowing of the leaves, were crossed with the original golden stock, the F_1 plants all were golden, indicating that the two parents of each cross were identical in their genetic factors for golden.

It was found that gama grass, Tripsacum, will readily pollinate corn if the husks are removed from the corn ears and the silks cut back to a length of approximately 0.5 in. Seeds resulting from such pollination contained a fairly normal endosperm and embryo, as shown by microscopic sections, but were very much retarded in development and seldom reached maturity.

Topping 14 days after silking at Beeville reduced the corn yield 26 per cent, 26 days 18 per cent, and 38 days after silking 3 per cent. Stripping the leaves from the plants 26 days after silking reduced the yield 44 per cent.

[Agronomic and plant breeding work of the Landsberg, Prussia, Experiment Station], Densch, A. Könekamp, W. Heuser, et al. (*Jahresber. Preuss. Landw. Vers. u. Forschungsanst. Landsberg a. d. Warthe, 1928–29, pp. 20–24, 24–51, 85–103, figs. 4*).—Continued investigations (E. S. R., 58, p. 130) for 1928–29 resembled in general scope those noted earlier.

List of publications on the botany of Indian crops, F. J. F. Shaw and R. D. Bose (*Imp. Inst. Agr. Research, Pusa, Bul. 202 (1930), pp. V+256*).—Most of the papers included in this comprehensive bibliography deal with various phases of the genetics of the principal cereal, legume, oilseed, fiber, root, sugar, and forage crops of India, although many entries are concerned with production practice, fertilization, physiology, utilization, plant diseases, and experimentation.

Grasses and clovers, H. H. Finnell (*[Oklahoma] Panhandle Sta., Panhandle Bul. 16 (1930), pp. 13–18*).—Trials of varieties of tame grasses and clovers from 1924 to 1928, inclusive, showed that of the annuals only Hubam sweetclover promised possible usefulness. Alfalfa was outstanding among perennials, and, while varietal differences were not large, common alfalfa appeared best for the region. Both white and yellow biennial sweetclover seemed adapted, although seedings of sweetclover were not so uniformly successful as of alfalfa. Red clover could not compete with alfalfa in duration of stand. No other perennial grasses or clovers showed signs of possible adaptation.

Annual legumes on the heavy soils of the Panhandle of Oklahoma, H. H. Finnell (*[Oklqhoma] Panhandle Sta., Panhandle Bul. 17 (1930), pp. 3–11, figs. 12*).—The grain and hay yields of varieties of cowpeas, soybeans, and mung beans grown in comparison are tabulated for the period 1924–1929. Blackeye and Early Buff cowpeas were outstanding in grain production, and Whippoorwill, Early Red, Blue Goose, and Blackeye made the higher hay yields. Laredo soybeans made about 0.25 ton more hay than the best variety of cowpeas but only matured seed once in a 4-year period. Profitable seed yields from soybeans were had in only 1 of 6 years.

Investigations on yield in the cereals, V–VII (*Jour. Agr. Sci. [England], 18 (1928), No. 2, pp. 317–345, fig. 1; 19 (1929), No. 3, pp. 472–490, figs. 2; 20 (1930), No. 2, pp. 265–344, pl. 1, figs. 5*).—Earlier studies (E. S. R., 58, p. 830) are supplemented by three additional contributions.

V. *A study of four wheat fields: The limiting effect of population-density on yield and an analytical comparison of yields*, L. R. Doughty and F. L. Engledow.—Four fields of winter wheat differing widely in soil and standard of husbandry were subjected from planting to harvest to periodic determinations of population density and of development, as judged by tillering.

The characteristic occurrence of sharply localized fluctuations in density from point to point along the rows of plants was fully confirmed. Developmental studies on the four fields showed that at all growth stages the density fluctuation must be regarded as essentially the result of irregular drill action. Marked differences in yield rates upon the same area were associated with corresponding variations in tillering and spike size in the manner usually characterizing the influence of spacing upon growth.

Some 60 to 80 per cent of the seed sown appeared to survive and give harvest plants, almost all of the loss of plants occurring before May. Tillering evidently was not influenced by population density up to some critical period of spatial effect, around March 31. While probably not common to all spacings, this might be regarded as the effective critical period for winter wheat. It appeared probable that a critical period of tiller formation also occurs toward March 31, the concurrence of the two periods emphasizing the large predetermining effect of early development, as seen in early tillering, on yield. The influence of early applications of nitrogenous fertilizer on early development is indicated.

VI. (*A*). *A developmental study of the influence of nitrogenous top-dressing on wheat.* (*B*). *A measurement of the influence of disease ("take-all") upon the yield of wheat*, L. R. Doughty, F. L. Engledow, and T. K. Sansom.—Winter wheat of the Cambridge Browick variety top-dressed February 28 with 1.5 cwt. of ammonium sulfate per acre was not superior to untreated wheat in tillering before the normal critical period of tillering and only bore about 10 per cent more heads per plant at harvest. Almost the whole effect of top-dressing on yield, on dressed plats 26.4 bu. per acre and untreated 19.1 bu., was due to increase of size of heads. An unusually heavy outbreak of "take-all" occurred in the crop, such that 24.6 per cent of the spikes were affected on the dressed areas and 32.5 on the untreated areas. The respective average grain yields for all spikes on the areas were 1 gm. and 0.76 gm., healthy spikes 1.21 and 0.98, and affected spikes 0.39 and 0.27 gm.

VII. *A study of development and yield of wheat based upon varietal comparison*, F. L. Engledow and K. Ramiah.—During four years, 1924–25 to 1927–28, inclusive, Squarehead Master and Yeoman, both *Triticum vulgare*, and Rivet (*T. turgidum*) wheats were compared at different spacings, including ordinary field planting. Development was traced by periodic observations on tillering and special attention paid to the critical period. A life history of the wheat plant was outlined from the combined results of various experiments, and secondary studies were made upon germination, intervariety competition, and certain forms of parasitic damage.

Throughout the four years the varieties maintained a constant order in respect of 13 major and certain other plant characters; e. g., the order was Yeoman>Squarehead Master>Rivet for rate of germination, percentage of germination, plant survival, rate of leaf development, rate of early tillering, and spike formation. Early tillering was an important index to yield, its time limits constituting a definite characteristic of every variety.

With change in spacing the varieties kept the same relative order of magnitude in tillering and other attributes as with uniform spacing, although important differences occurred in varietal response to spacing, particularly in size of side tiller spikes compared with the main axis spike. The development of varieties in relation to each other under field conditions resembled closely that on the plats, whereas for varieties as a group tillering, spike formation and size, and yield per unit area attained much lower values in the field, and the response of tillering to spacing was far less marked. These effects appeared due to the better cultural conditions of the plat, especially regularity of planting.

When Squarehead Master and Yeoman were sown in the same hills and also in adjacent rows a significant degree of varietal interference was not evident in the development and final yield. Periodic removal of two of three spring barley plants from the row, commencing just after the critical period of tillering, induced extra tillering, particularly in the case of the early thinnings. However, the extra tillers did not survive, and at harvest all the treatments yielded about the same as the unthinned control.

The data indicated that of seeds planted from about 60 to 90 per cent survive to harvest plants on experimental plats and from 50 to 80 per cent in the field. It was demonstrated that on poor seed beds germination may be very low, particularly with inferior seed, e. g., samples germinating 90 and 80 per cent in the laboratory gave, respectively, 65 and 32 per cent on a very rough field tilth. Rivet wheat was characteristically lower and slower in germination than the other two wheats. It was indicated that losses of 15 to 20 per cent may occur in some field plantings from defective late germinating seeds. Rate of germination seemed to be controlled largely by the accumulated temperature of the first few weeks after planting, although rainfall also appeared important. The progress of tillering appeared to be related to rainfall and accumulated temperature, e. g., rapid tiller increase being associated with relatively high temperature. The effect of drought on the development of wheat also was recorded. Observation in one experiment demonstrated that if plant development be a fair reflection of soil heterogeneity, then the distribution of heterogeneity over the plat area is not constant throughout the season. Final plant development on a plat is closely related to development at the end of April.

A classification and description of barley varieties grown in South Africa, J. T. R. Sim (*Union So. Africa Dept. Agr., Sci. Bul. 78 (1929), pp. 34, figs. 34*).—Thirty-one varieties of barley grown in South Africa are described and are classified according to the scheme of Harlan (E. S. R., 38, p. 833). Synonyms are given where known.

The possibility of utilizing selfed strains in practical corn improvement, A. N. Hume (*South Dakota Sta. Bul. 245 (1930), pp. 22*).—Corn continuously selected for yield for 17 years by mass selection averaged 48.1±2.2 bu. per acre; by systematic ear-row selection with detasseling of alternate rows, as described by the Illinois Station (E. S. R., 17, p. 26), 49.2±2.2 bu.; and by selection of high-yielding ear remnants, according to Ohio Station methods, 52.5±2.5 bu. It appeared that the Illinois and Ohio systems furnished a more rapid process of adaptation than mere choosing of the best seed ears by mass selection. Evidently continuous selection by such methods is a means of selecting superior strains, although not of itself adequate for genetic improvement.

The progeny of ear-row selections long continued by the above methods were observed to possess a degree of close breeding and appeared capable of serving as a parent when hybrid vigor is desired. Row yields in 1929 from near hybrids (S_5 strains selfed for five generations × Selection 1210, a close-bred selection) were 35 per cent higher than yields from selected strains. Similarly, five of six of the same near-hybrid strains in a variety test outyielded the standard variety.

A system of corn improvement outlined proposes to continue to utilize ear-row selection and thus serve to maintain adapted strains and varieties now generally recognized and to utilize the principle of hybrid vigor and prevent losses from close breeding by introduction of selfed or other close-bred strains.

Determining the date of silking in experiments with corn, M. T. Meyers (*Jour. Amer. Soc. Agron., 22 (1930), No. 3, pp. 280–283*).—The method outlined for obtaining the median date of silking in corn is described as easy and convenient and adequate for the purposes of many experiments.

[Cotton investigations in Texas] (*Texas Sta. Rpt. 1929, pp. 50–53, 55, 62, 63, 97, 98, 103, 104, 106, 108, 109, 110, 113, 122, 123, 126–128, 130, 132, 134, 135, 145, 149*).—Further studies with cotton (E. S. R., 62, p. 631) at the station and substations embraced variety, cultural, and fertilizer tests, breeding work, inheritance studies, and harvesting and ginning experiments.

Results obtained since 1926 at the station without irrigation and at Iowa Park under irrigation indicate that fertilizers have no appreciable influence on the length of lint. All fertilizer treatments increased the percentage of 5-lock bolls in comparison with untreated soil, and, furthermore, the percentage appeared to rise as the quantity of phosphorus in the fertilizer was increased. Heavy applications of fertilizers, 600 to 800 lbs. per acre, resulted in slightly larger bolls than the lighter applications. Bolls developing early in the season averaged from 15 to 20 per cent larger and produced slightly longer lint than those developing later in the season.

A form of chlorophyll deficiency in which the adult cotton leaves are marked with irregular areas devoid of chlorophyll appeared to be a type of cytoplasmic or maternal inheritance and has been found in the Truitt, Trice, Acala, and Mebane varieties. Plants so affected generally lack vigor, resulting in poor stands and lower yields. The progeny of self-fertilized seed from a plant of Mebane cotton produced several different types of boll chimeras. Studies of the inheritance of the virescent yellow type of chlorophyll deficiency, continued into the F_4 generation, indicated that it is determined by a single factor. The F_1 of crosses between red and green leaved plants all had red leaves, and the F_2 segregation indicated that a single factor was involved. Red leaf also was dominant in F_1 to virescent yellow.

In the F_1 of hybrid lines of crosses of Durango on Mebane, Lone Star, Express, Westex, sea island, and Pima, the cluster type of fruiting of Durango was found recessive. A number of characters, as long lint, petal spotting of the flowers, color of pollen, and length of vegetative and fruiting branches of the sea island and Pima parents, were dominant to these characters in Durango in F_1. Efforts to develop a cotton with fruiting and vegetative characters better adapted to harvesting by machinery than varieties now grown are described.

When three lots of cotton stapling 1 in., 1⅛ in., and 1¼ in., respectively, were ginned under different conditions, including saw speeds of 640, 760, and 840 revolutions per minute, with a loose, medium, and tight breastroll setting for each saw speed, the market value of the lint evidently was lowered when the cotton was ginned with a tight breastroll, particularly with the longer staples, which in some instances were badly gin cut.

Comparison of a commercial stripper, a modified finger type stripper, and single slot type stripper for harvesting cotton showed the commercial stripper to be the most efficient of the machines compared throughout the season, harvesting the equivalent of 560 lbs. of picked cotton an hour in cotton yielding one-half bale per acre on upland soil. Cotton harvested by the machines graded lower than cotton picked by hand at the same time, largely because the sample contained small amounts of leaf and boll trash, which the cleaning equipment at the gin was unable to remove completely from the seed cotton. Of the different plant characters studied in the 12 cotton varieties in the experiment, the amount of vegetative growth, earliness, storm resistance, and size of boll seemed to be the more important. Rank-growing varieties maturing late and with small bolls lacking in storm resistance were more difficult to harvest, and the percentage of cotton wasted exceeded that in varieties without these characteristics.

Cotton map of Peru, 1928 crop [trans. title], M. Montero Bernales (*Vida Agricola, 7 (1930), No. 75, pl. 1, op. p. 164*).—This map presents in both Spanish and English information of the scope noted earlier (E. S. R., 59, p. 132).

Annual report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1929 (*Indian Cent. Cotton Com., Bombay, Ann. Rpt. 1929, pp.* [2]+*105, pls. 3*).—The technological research, marketing, and administrative activities of the organization in different localities in India are reported on for 1929.

Flax facts, H. L. Bolley, H. L. Walster, A. C. Arny, A. N. Hume, C. McKee, A. C. Dillman, et al. (*Minn. Univ. Agr. Ext. Spec. Bul. 128 (1930), pp. 32, figs. 2; Mont. Agr. Col. Ext. Bul. 107 (1930), pp. 32, figs. 2; N. Dak. Agr. Col. Ext. Circ. 90 (1930), pp. 32, figs. 2; S. Dak. Agr. Col. Ext. Circ. 293 (1930), pp. 32, figs. 2*).—A popular discussion, issued jointly in cooperation with the U. S. Department of Agriculture, of the current status and outlook for flaxseed production in the United States is presented, with special information on the status of and cultural practices suitable for flaxseed production in North Dakota, Minnesota, South Dakota, and Montana.

Wild and cultivated oats: Sectio Euavena Griseb. [trans. title], A. I. Mal'tsev (Malzew) (*Trudy Prikl. Bot., Genet. i Selek. (Bul. Appl. Bot., Genet.*

and Plant-Breeding), 1930, Sup. 38, pp. III+522, pls. [103], figs. [67]; Eng. abs., pp. 473–506).—Part 1 of this monograph treats of the history, the principal systems of classification, and the morphological, biological, and physiological characteristics of oats; part 2 presents botanical descriptions of all known forms of the section Euavena in the order of the newly proposed system; part 3 sets forth information on the ecology, geography, archaeology, origin, and relationships of the species of Euavena; and part 4 discusses the control of wild oats as a weed.

The effect on yield of sprout removal from potato seed tubers, K. C. WESTOVER (*Amer. Soc. Hort. Sci. Proc., 25 (1928), pp. 53–57*).—The storage losses, stands, and yields obtained at the West Virginia Experiment Station from seed potatoes which had the sprouts removed from one to five times before planting indicated that the practice of removing sprouts from improperly stored potato seed stock increases the loss in storage from decay, reduces the stand of plants in the field and lowers their vigor, and decreases the yield of prime tubers and the total yield. It appeared questionable if tubers which have had the sprouts rubbed from them more than once are of much value as seed stock.

Soybean production in Kansas, J. W. ZAHNLEY (*Kansas Sta. Bul. 249 (1930), pp. 31, figs. 10*).—Cultural methods and field and harvesting practices for growing soybeans for seed and hay and in corn are suggested from the experiments and experience of the Kansas and other stations. The hay and seed yields of varieties of soybeans and cowpeas are tabulated in comparison, and brief descriptions of important soybean varieties are included.

A study of the structure of sugar beets in relation to sugar content and type, E. ARTSCHWAGER (*Jour. Agr. Research [U. S.], 40 (1930), No. 10, pp. 867–915, pls. 3, figs. 14*).—Anatomical study of 30 sugar beet selections of W. W. Tracy, comprising 1,700 individuals grown in Colorado in 1927 and 1928, was made to find characters to aid in determining purity of a type, in delimiting it more sharply, and in testing on an enlarged scale theories of a possible connection between anatomical structure and sugar content.

The structural configuration of the different selections, for certain characters at least, appeared to be specific and to suggest the possibility of obtaining for strains which have become homozygous through continuous selection a fairly stable anatomical type picture which would aid in delimiting a type and keeping it pure. For such type pictures entire cross sections of as many beets of a selection as can be obtained must be examined. With prospective seed beets the measurements must be limited to a median section of a cork borer sample through the central neck region.

The sharpness of the zonation as seen in a cross section seemed to be bound up with the flesh color, being least marked in pure white individuals and most prominent in poor, watery ones. The relative width of the vascular zones and the interzonal parenchyma varies indifferently, though in some selections the vascular tissue forms conspicuously broad rings.

The number of mature rings usually is about one-half of the total number produced, and a high total ring number is often correlated with a high mature number, but occasionally the opposite is true. The relative ring width of the mature rings usually is related to the weight and slightly to the ring number of the beet, but this correlation is absent in beets with a relatively small ring number. The ring density coefficient can be indicative of percentage of sucrose, except where ring number or ring width shows no relationship. The size of the central core and usually the number of core rays are related neither to the percentage of sucrose nor to the weight of the beet. While vascular ring prominence and sugar content in general are independent variables, in beets where broad vascular zones are associated with a high ring density coefficient a high sugar content is usually assured. The number of vascular bundles of a ring and the number of xylem cells appeared to bear no relation to the percentage of sucrose. A number of selections showed the presence of a smaller or larger number of lignified sugar-sheath cells. While the phloem tissue is well developed in most beets, very rich individuals always have a very massive phloem. Although the size of the interzonal parenchyma cells showed no important correlation with percentage of sucrose, it may be related within a selection to the width of the rings.

Beets grown in 1928 had in general a higher average percentage of sucrose, more rings, a smaller central core, and a smaller first ring diameter than those grown in 1927. Since the differences were only of degree, and since the different selections reacted similarly, type characters were not obliterated.

The anatomical type picture appeared to vary in different beet selections, and although the structural features associated with high sugar appeared to be understood, the ideal structural configuration was not always the same.

Field experiments on sugar-cane (*Trop. Agr. [Trinidad], 7 (1930), Nos. 4, pp. 101–104; 5, pp. 125–131*).—Standards outlined by a subcommittee of the West Indian Conference of Agricultural Officers for field experiments with sugarcane are concerned with the size, arrangement, and replication of plats in variety, spacing, and fertilizer tests.

Physiological shrinkage of sweet potatoes in curing, W. D. Kimbrough (*Amer. Soc. Hort. Sci. Proc., 25 (1928), pp. 59, 60*).—Determinations at the Alabama Experiment Station on Porto Rico sweetpotatoes cured for about two weeks at a constant temperature of 30° C. with both moist and dry atmosphere showed that shrinkage is due largely to loss of moisture, even though the percentage of moisture may decrease only slightly compared to total shrinkage. The loss of solids due to respiration was about 1 per cent fresh weight and around 3 per cent dry weight. Loss of solids did not differ much because of variations in humidity, although the moisture content of potatoes kept in moist air rose slightly.

Steam sterilization of soil for tobacco and other crops, J. Johnson (*U. S. Dept. Agr., Farmers' Bul. 1629 (1930), pp. II+14, figs. 7*).—Superseding Farmers' Bulletin 996 (E. S. R., 40, p. 135), this publication gives information on the effects of and methods for sterilizing soil and the details of the inverted pan method of steaming the soil, and discusses briefly the management of steam sterilized plant beds, cost of steaming, and soil steaming for crops other than tobacco.

A test of the effect of environment on genetically similar Marquis wheat, J. B. Harrington (*Sci. Agr., 10 (1930), No. 8, pp. 513–519, figs. 2*).—Study of morphological characters in genetically similar Marquis plants grown in six localities of western Canada in 1928 demonstrated that the effects of environment were not important as far as critical spike and glume characters were concerned.

Field technic for determining comparative yields in wheat under different environmental conditions in China, T. H. Shen (*Jour. Amer. Soc. Agron., 22 (1930), No. 3, pp. 193–215*).—Competition, the number and field arrangement of replications, and the size of plat were studied in wheat varietal tests made at Nanking in southeastern China from 1925 to 1928 and at Kaifeng in northern China from 1926 to 1928. The plats were 48 sq. ft. in area with three rows each 16 ft. long, 1 ft. apart, and running north and south. The check variety occupied every third plat. Every variety was replicated nine times, and each row was harvested separately.

Many varieties did not show significant disturbance from competition, and some behaved differently in competition in the two places and at different seasons. Only a few varieties showed significant competition throughout the period at Nanking. The yield of varieties showed significant correlation with competition at Nanking but not at Kaifeng.

The range of soil variability appeared to be greater when large areas are included, and the use of too few replications seemed to increase the size of the probable error. The 8- or 10-consecutive plat method of field arrangement gave the smallest probable errors. The three-row plat was evidently only slightly better than the two-row and single-row plats under the conditions prevailing.

Criticism of the limitations of the statistical method, J. A. Harris (*Jour. Amer. Soc. Agron., 22 (1930), No. 3, pp. 263–269*).—Comment on the views of Salmon (E. S. R., 62, p. 424) is given.

The statistical method: A reply, S. C. Salmon (*Jour. Amer. Soc. Agron., 22 (1930), No. 3, pp. 270, 271*).—A reply to Harris.

Weeds in modern agriculture, E. Korsmo, edited by H. W. Wollenweber (*Unkräuter im Ackerbau der Neuzeit. Berlin: J. Springer, 1930, pp. IX+580, figs. [478]*).—This comprehensive volume deals in successive chapters with the biological groups and the host crops and situations of weeds, damage caused by weeds, means of dissemination, weed seed and vegetative roots in arable land, weed species and their characteristics, including chemical composition, and control measures. A résumé of some Norwegian experiments on weed control and a comprehensive bibliography are also included. A similar work in Norwegian has been noted earlier (E. S. R., 55, p. 235).

Weeds of meadows and their control and the fertilization of meadows, H. Raum (*Die Wiesenunkräuter und ihre Bekämpfung einschliesslich der Wiesendüngung. Freising-Munich: F. P. Datterer & Co., [1929], 2 ed., enl., pp. 75, pls. 8, figs. 11*).—The characteristics of important weeds of meadows and pastures are described, and methods for their control by cultural practices are outlined. The effects of various fertilizers on the yields and quality of hay are reviewed, and their practical applications are indicated.

Perennial weeds which spread vegetatively, B. F. Kiltz (*Jour. Amer. Soc. Agron., 22 (1930), No. 3, pp. 216–234, figs. 10*).—The root systems of 10 common perennial weeds which spread vegetatively are described from excavations made by the Nebraska Experiment Station. These weeds and the maximum depths of their root systems included field bindweed (*Convolvulus arvensis*) 17 ft., hedge bindweed (*C. sepium*) 6, Canada thistle (*Cirsium arvense*) 8, pasture thistle (*C. canescens*) 6, perennial smartweed (*Polygonum muhlenbergii*) 8 or more, sheep sorrel (*Rumex acetosella*) 5, common milkweed (*Asclepias syriaca*) 8, Indian hemp (*Apocynum cannabinum*) 5, horse nettle (*Solanum carolinense*) 8, and perennial ragweed (*Ambrosia psilostachya*) 6 ft. Hedge bindweed and perennial smartweed propagate by rhizomes and the other eight by creeping roots.

HORTICULTURE

[Horticultural investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1929, pp. 42, 49–55, 58, 59*).—Again discussing (E. S. R., 61, p. 227) the arsenic residue problem, it is reported that unwashed fruit was below 0.02 grain of arsenic per pound and that washing reduced all fruit below 0.01 grain.

Following two off years the 1929 fruit crop was good with the exception of the Rome apple which bore a fair crop in 1928.

Transplanted tomato plants produced ripe fruit only one week earlier than did field-sown plants, and there was but little difference in the amount of blight. Data are presented on the economics of tomato growing at the College.

Cabbage set in the field on February 20, 1929, was severely injured by freezing but nevertheless showed good survival and yielded well. In the long-continued fertilizer test with cabbage the plat treated with 1,000 lbs. per acre of cottonseed meal was the most productive. The injurious effect of shade trees on cabbage was shown in yields of 25,296, 20,776, and 6,378 lbs. per acre for unshaded, partly shaded, and badly shaded areas, respectively.

Notes are given on the results of varietal tests of various tree and bush fruits, nuts, grapes, etc. Various fertilizers were compared on head lettuce sown September 3, but since very few marketable heads formed on any of the plats the results are not considered conclusive. Sweet peas sown November 1 bloomed March 10, with considerable difference between varieties in respect to winter hardiness. Miscellaneous observations are presented on Chile Ancho, asparagus, and watermelons.

[Horticultural investigations at the Texas Station] (*Texas Sta. Rpt. 1929, pp. 15–24, 25–29, 106–108, 111, 112, 113, 114, 128–130, 133, 134, 142–145, 150*).—Reporting as in the preceding year (E. S. R., 62, p. 636) on the results of adaptability tests, it is stated that favorable results were obtained with the pistache and persimmon. Among 442 seedlings obtained by crossing Nessberries with other varieties there were some which did not possess the objectionable adherent calyx. Further crosses were made with the Van Fleet raspberry to intensify this trend. Lawton was crossed with the Pink blackberry, and both varieties were selfed to study their genetic composition. Inconclusive results in fig fertilizer tests were traced to the fact that the roots extend at least 23 ft. from the trunk. Heavy pruning of the fig delayed maturity, while moderate pruning was beneficial by extending the ripening period. Bordeaux mixture (5–5–50) applied at 30-day intervals was the most effective control for fig diseases. Certain varieties of grapes were found satisfactory at the Balmorhea Substation and at College Station. Training Munson hybrid grapes to the four-arm Kniffin system resulted in a saving in labor over the Munson system.

Studies continued over a 5-year period on factors influencing the set of pecans showed that wind-carried pollen germinates on the stigma, the pollen tube growing down to the ovule and normally completing fertilization in about four weeks. A heavy drop of nuts at this stage is believed due to lack of fertilization, traceable to a deficiency of pollen at the proper time. Many pecan varieties did not mature pollen at the time the pistillate flowers were receptive. Among these were Schley, Stuart, Delmas, Success, Burkett, and Moneymaker, whereas Moore, Alley, Texas, Prolific, and San Saba always produced early pollen. Cool, dry weather tended to delay pollen maturity, while moist, warm weather was favorable.

Attempts to root stem cuttings of pecan were all unsuccessful, but in a few cases plants were secured from root cuttings. Various reciprocal budding experiments were carried on between the pecan and related genera.

Studies were made on the propagation and culture of Pyrethrum as a source of insecticides, and miscellaneous studies were carried out with truck crops, including rhubarb, New Zealand spinach, asparagus, cucumber, tomato, etc. Under irrigation asparagus plants were grown to a satisfactory planting size in a single season. Paper mulch was tested at various locations without much success. Because of great variability in commercial stocks the Honey Ball melon was selfed to isolate pure lines. Wilt-resistant tomato strains were developed at Troup. Notes are presented on various ornamental plants and their utilization.

In a study of factors affecting the quality of fruit, analyses were made which showed that in the lower Rio Grande Valley grapefruit changes only slightly during the marketing season and that the ratio of solids to acids is normally 7 or above. Chemical studies of the Magnolia fig showed that the gain in sugars and other constituents after the commercial stage is reached is not sufficient to warrant delay in harvesting, and that the tree-ripe Magnolia fig compares favorably with the Kadota fig. Two tung-oil varieties, Troup and Taes, were compared as to oil content, with results in favor of the first.

Work with tomatoes at the Troup Substation indicated that paper mulch is of doubtful value because of its lack of durability and its inability to check Bermuda and nut grasses. Observations on tung-oil trees indicated that the species is best adapted to well-drained sandy loam soil free from lime.

At the Angleton Substation fig rust was satisfactorily controlled by five applications of Bordeaux mixture. The root spread of figs and the effect of pruning on yield were studied. Similar work with figs was carried on at Beaumont, where also various citrus forms were tested. The kumquat proved very well adapted for fruit production and ornamental use.

At the Lubbock Substation the Chinese elm, Chinese arbor vitae, and Arizona cypress proved highly promising.

At Balmohrea hardy varieties of vinifera grapes gave much promise, and several ornamentals were found with capacity to withstand unfavorable weather conditions.

At the Weslaco Substation the beneficial effect of fertilizer on citrus was observed, with no evidence of superiority of any one material. Inherent tree differences apparently accounted for a considerable part of the variability. Wind and dust caused injury to border trees. Grapefruit proved more vigorous than oranges, and comments are given on varieties of each. Dates obtained from California made good growth, and a consignment of offshoots from Iraq (Mesopotamia) survived satisfactorily. Notes are presented on variety tests with vegetables and grapes, and yields were recorded on individual tomato plants in a fertilizer test, with some evidence in favor of complete fertilizers.

Experiments with various types of glass [trans. title], J. Reinhold and M. Schmidt (*Gartenbauwissenschaft, 3 (1930), No. 4, pp. 301–330, figs. 10*).—In this second report (E. S. R., 61, p. 834) on the results of testing various glass materials as protective coverings for plants no significant differences were observed in favor of ultra-violet light transmitting glasses.

Method of testing the capacity of fruit and vegetable containers under the United States standard container acts, H. A. Spilman and T. C. J. Baker (*U. S. Dept. Agr., Misc. Pub. 75 (1930), pp. 14, figs. 9*).—To assist in carrying out the provisions of certain Federal statutes the procedure for testing the capacity of hampers and round stave and splint baskets is outlined in detail. A bulk-for-bulk method using clean, unbroken rapeseed as a measuring medium is described.

Spinach for canning: The relation of physical and chemical properties to quality, F. W. Geise (*Maryland Sta. Bul. 320 (1930), pp. 303–326, figs. 6*).—Of the three crops of spinach, fall harvested, overwintered, and spring sown, possible under Maryland conditions, that harvested in the first half of the fall season produced the highest yields of trimmed spinach, while the overwintered crop averaged low in yield. Quality declined rapidly in the fall crop with the advance of the season, this loss being accompanied by a decline in moisture content, an increase in percentage of total and invert sugars, and a decline in total hydrolyzable substances with no evidence of any correlation between season and the percentage of crude fiber. Total and invert sugars were less in young than in mature leaves, while the percentage of total nitrogen was greatest in the young leaves.

Based on storage experiments in controlled temperatures, the author concludes that the high percentage of total and invert sugars in the fall crop may be correlated with low temperatures prevailing at that time. Spinach stored at 26° F. gained slightly in moisture, while that at 40° and from 60 to 70° lost moisture in direct proportion to the advancing temperature. Loss in invert and total sugars was greatest at the higher temperatures.

Practical deductions are offered.

A survey of the soils and fruit of the Wisbech area, C. Wright and J. F. Ward (*[Gt. Brit.] Min. Agr. and Fisheries, Research Monog. 6 (1929), pp. 71, pls. 7, figs. 5*).—Interesting information is presented on the relation between the texture of the soil and the growth of the tree, the character of the fruit, and the susceptibility of apples and plums to silver leaf disease.

The value of sugar solutions for determining the usefulness of pollen [trans. title], F. Passecker (*Gartenbauwissenschaft, 3 (1930), No. 3, pp. 201–236*).—Comparing results obtained in the laboratory with those secured in the orchard, the author states that pollen germination tests in suitable sugar solutions without the addition of pistils gave in the case of the apple and pear a true picture of pollinating capacity. On the other hand for the stone fruits, cherries in particular, actual pollination tests were found more desirable. For the determination of self-fruitfulness it is advised that actual pollination tests are alone reliable.

Cross-unfruitfulness in the apple, O. Einset (*New York State Sta. Tech. Bul. 159 (1930), pp 24*).—Presenting a general survey of experimental work on cross incompatibility in the apple, the author discusses the results of experiments on various factors, such as experimental technic, which may bear on the problem. Comparing the effect of removing the sepals, petals, and stamens with simply removing the petals and stamens, it was found that in certain varieties the removal of the sepals apparently interfered greatly with fruit setting; hence it is concluded that in certain reported cases of incompatibility, for example, crosses on Delicious, the negative results obtained may have been due to an injurious type of emasculation. No significant difference was noted between translucent and white opaque paper sacks as covers for emasculated blooms, but only light sets were secured without cover. Much of the incompatibility reported is believed due to zygotic abortion caused by irregularities in the reduction division of the generative cells. Irregular chromosome behavior in triploid varieties is deemed the cause of zygotic abortion and suggests the inadvisability of interplanting triploid varieties. In the Gravenstein apple, fruit weight was directly correlated with a combined number of both empty and filled seeds.

Simple pruning, N. Catchpole, edited by A. J. Macself (*London: W. H. & L. Collingridge, [1930], pp. IX+130, figs. 25*).—A general discussion from the English viewpoint.

Pruning fruit plants, R. J. Barnett (*Kansas Sta. Circ. 153 (1929), pp. 23, figs. 8*).—A revision of the previously noted circular (E. S. R., 51, p. 40).

Pruning the red raspberry, W. G. Brierley (*Minn. Hort., 58 (1930), No. 6, pp. 169, 170*).—Supplementing a previous contribution on the same subject (E. S. R., 62, p. 230), the author reports that in the following season yields increased in direct proportion to the length of canes left at pruning. The yields were approximately 114, 133, 152, 171, and 190 crates of raspberries, respectively, for the 36-, 42-, 48-, 54-, and 60-in. canes. The somewhat contrary results from those of the preceding year are thought due to winter injury in the former year of the upper portion of the canes.

Berry thinning of grapes, A. J. Winkler (*California Sta. Bul. 492 (1930), pp. 22, figs. 5*).—Discussing the principles and practices of berry thinning of grapes, the author presents the results of studies at Davis and in commercial vineyards which have shown that thinning may be highly beneficial. When the percentage reduction in number of berries ranged from 30 to 45 per cent, the reduction in weight of cluster was only from 20 to 30 per cent, the difference being due to increased size of the remaining berries. The reduced yields due to berry thinning was offset by more moderate pruning which left more clusters.

In the Tokay grape berry thinning induced a more uniform development of color, thus facilitating harvesting. The thinned clusters were considerably less dense at harvest and of a more convenient size for packing.

Three methods of berry thinning were utilized and are described, with the comment that where the degree of thinning was equal there were observed no differences in the size of berries, in coloration, or in weight of resulting clusters. The profits from thinning were derived from reduced costs of harvesting and packing and from the improved appearance of the fruit.

Influence of pollination on set of fruit in citrus, H. J. Webber (*Calif. Citrogr., 15 (1930), No. 7, pp. 304, 322, 323*).—Discussing the physiology of citrus pollination, including the phenomenon of apogamic embryos, the author reports that pollination is apparently not essential for fruit formation in many forms of citrus. Concerning cross-pollination, the author has never observed any case where mixed plantings were any more fruitful than were solid plantings of a single variety. However, the presence of bees in the citrus orchard is not considered harmful in any way.

The Brazil nut in Malaya, J. Lambourne (*Straits Settlements and Fed. Malay States Dept. Agr., Gen. Ser. No. 2 (1930), pp. [1]+15, pls. 6*).—Notes are presented on the growth and fruiting habits and the variability of Brazil nut trees, *Bertholletia* sp., set out in the spring of 1914 at the Kuala Lumpur Experimental Plantation.

Flower beds and bedding plants, S. Ashmore (*London: W. H. & L. Collingridge, [1930], pp. 92, pls. 33, figs. 9*).—A general discussion.

Roadside planting, "R. B. A." (*London: Country Life Ltd., 1930, pp. XIII+170, pls. 46, figs. 6*).—A general discussion by the Roads Beautifying Association of various plant materials and their adaptability to roadside planting under various conditions.

FORESTRY

Silviculture upon ecological foundations, A. Dengler (*Waldbau auf Ökologischer Grundlage. Berlin: J. Springer, 1930, pp. X+560, pls. 2, figs. 247*).—A comprehensive text and manual.

Yield, stand, and volume tables for Douglas fir in California, F. X. Schumacher (*California Sta. Bul. 491 (1930), pp. 41, figs. 23*).—With a view to aiding in the determination of yields of well-stocked, even-aged stands of Douglas fir in California, tables are presented computed from data taken on 159 sample plats scattered through the geographical range of the species in California. Stands of Douglas fir in this region were found to vary from stands of Oregon and Washington by having fewer trees to the acre throughout their life, and these decreased at a greater rate. California Douglas fir grew faster in basal area when young and ceased vigorous growth at a younger age than did the northern trees. The basic data and methods of computation are given in an appendix.

Making a model to show how forests prevent erosion (*U. S. Dept. Agr. Leaflet 58 (1930), pp. 3, figs. 2*).—Directions are presented upon the construction and operation of an educational exhibit.

DISEASES OF PLANTS

[Plant disease investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1929, pp. 29–31, 35, 36*).—Having observed (E. S. R., 61, p. 236) that considerably more chili plants died from wilt under level culture than where plants were set on ridges, records were taken on the relation between soil moisture and wilt, with the resulting observation that 11.5 per cent of soil moisture was found to be most favorable for plant development and least favorable for wilt. The largest yields were harvested on plats irrigated every 21 days. The average soil temperature was found to be 4° F. higher on the level than for ridge culture.

In the soil surrounding measled apple trees there were found 0.3929, 0.399, 0.434, 0.607, 0.497, 0.379, 0.6, and 0.56 per cent of soluble salts—too high for the best plant growth. Jonathan apple trees set in pots containing varying quantities of several salts succumbed after feeble attempts to grow. Grafts put in measled trees made good growth for a single season but developed measles the succeeding spring.

Applying dissolved aluminum sulfate to the soil about chlorotic grapevines and cottonwood and poplar trees gave favorable results.

Hot water treatment of pea seed resulted in an excellent stand of vigorous vines. One application of 50–50 sulfur and hydrated lime dust sufficed to control mildew on peas in the field.

[Plant disease investigations at the Texas Station] (*Texas Sta. Rpt. 1929, pp. 64–72, 114–118, 147, 148, 151*).—Cotton root rot disease (*Phymatotrichum omnivorum*) again received major consideration. It was found that the disease may be carried over the winter by a resting stage (sclerotia). Evidence was obtained that a strand stage is also partially responsible for the overwintering of the disease. The spore stage was not established as a means of spreading the disease. Spores were germinated, but no infection was secured from them.

The various modes of overwintering, namely, infected live roots, dormant strands, and sclerotia, are discussed in some detail.

Inoculation of healthy plants with soil taken from the immediate vicinity of diseased roots failed to produce infection, indicating that the soil itself is probably not a carrier of the fungus, except as it contains sclerotia. An examination of the roots of plants in situ gave no evidence that root rot spreads except by complete or proximate root contact. Strands apparently followed earthworm and other tunnels, thus giving an impression of soil penetration. In the loose soil of laboratory jars the root rot fungus did spread.

Concerning the influence of the soil reaction, evidence was obtained that the degree of acidity of the soil is an important factor in spread, the more alkaline soils showing the most rapid distribution. Sulfur was successfully used in changing the soil reaction in pots but not in the field.

Selection work was carried on with cotton, legumes, grapes, citrus, and ornamentals to isolate resistant strains or varieties. At the Temple Substation, formaldehyde and other soil disinfectants were tested without much success.

Noting the occurrence of Fusarium wilt of tomatoes on a wide range of soils, studies were made of soil reaction and its relation to wilt.

Sclerotium rolfsii was found associated with the wilting of seedling cotton plants, but was not found on mature plants, nor could such plants be inoculated.

Cotton root rot studies conducted at the Temple Substation included a study of susceptibility of various native and cultivated species. A total of 120 species, mostly cultivated, were found to be susceptible. Cotton was studied for individual plant resistance, and certain plants were found with possible resistant qualities. On the other hand, sweetclover was almost completely susceptible.

Nursery stocks were tested and showed certain forms of Prunus and several oaks and grapes that possessed resistance. Various cultural aspects, such as time of planting, fertilizers, and varieties of cotton, were studied in relation to root rot. No single fertilizer or combination thereof proved of any value in reducing the disease. Organic mercury compounds gave some benefit with shrubbery. Fallowing the soil gave inconclusive results. The live roots were eradicated with 18 months fallow, but sclerotia and fungus strands survived to inoculate the new crop. Subsoiling to a depth of 16 in. in September materially reduced root rot and increased the yield of seed cotton by approximately 20 per cent.

A definite correlation was shown between soil moisture and summer spread of the fungus. Soil temperatures were favorable to fungus development from May to October. The percentages of lesions on roots were 67.31, 21.16, 7.69, and 3.84, respectively, for the 1–8, 9–16, 17–24, and 25–32 in. layers. Life history studies of root rot showed that rhizomorphic strands and sclerotia occur to considerable depths. The strands were successfully used in the inoculation of healthy plants.

Cooperative experiments with farmers indicated that the longer and frequently cultivated fallows were effective in reducing root rot. Sulfur in some locations gave partial control but also caused injury to the stand of cotton.

Root rot studies at the Weslaco Substation revealed several resistant grape species. The sour orange was only partially susceptible, while the Trifoliata and Cleopatra oranges were highly susceptible. The Turks Cap hibiscus proved resistant, while other related species were highly susceptible. Disinfectants used on the seed or with the seed were not effective in reducing root rot. Root rot extended downward on affected plants to a depth of from 24 to 30 in. and outward 5, 8, and 15 ft., respectively, on the grape, fig, and jujube. Sulfur 5,000 lbs. per acre changed the soil reaction from pH 8.3 to 4.2. Root rot caused approximately 19.54 per cent loss of stand in certain cotton plats and much loss in citrus, woody plants, and ornamentals.

At Iowa Park, of 49 varieties of alfalfa grown in 1927 and artificially inoculated with cotton root rot, none proved entirely immune, though 2 Baltic, 1 Chilean, and 1 hairy Peruvian showed tolerance, and some others possessed the power of reestablishing themselves. The Austrian winter pea, hairy vetch, and certain winter legumes gave some promise under conditions of mild root rot activity. Flooding during the winter did not completely eliminate the disease.

A parasitic member of the Mucoraceae [trans. title], B. PEYRONEL (*Nuovo Gior. Bot. Ital., n. ser., 34 (1928), No. 5, pp. 1267–1274*).—An account is given of a mold fungus, allied to if not identical with *Dicranophora fulva* and said to be parasitic on *Paxillus involutus*, also on *Gomphidius viscidus*.

Toxicity of sulphur to spores of Sclerotinia cinerea as affected by the presence of pentathionic and other sulphur acids, O. N. LIMING and H. C. YOUNG (*Jour. Agr. Research [U. S.], 40 (1930), No. 10, pp. 951–962, figs. 12*).—Of the several sulfur acids that might cause foliage injury, pentathionic acid, apparently an oxidation product of sulfur, is believed to be the harmful causal factor. Other acids, sulfuric, sulfurous, dithionic, and trithionic, were only slightly, if at all, toxic. Sulfur filtrates secured from wetted sulfur contained pentathionic acid and were toxic, while reciprocally sulfur that was freed of pentathionic acid, either by strong alkali or by washing, was not toxic. Acid-free sulfur, aerated eight hours, regained toxic properties and was found to contain pentathionic acid. Sulfur-lime mixtures when exposed to air, light, and heat in the presence of moisture tended to become less alkaline, while closed checks in the laboratory showed no such change. In field tests, sulfur to which an oxidizing agent was added was more effective than ordinary sulfur in the control of apple scab.

The work was carried on at the Ohio Experiment Station.

The fineness of ground sulfur sold for dusting and spraying, L. R. Streeter and W. H. Rankin (*New York State Sta. Tech. Bul. 160 (1930), pp. 16, figs. 3*).—Stating that nothing is known of the variations in the actual size of particles in commercial ground sulfur dusts other than that the maximum is about 50μ, the authors describe a standard method of sieving sulfur, which gives accurate results for sieves as fine as No. 325 of the U. S. Sieve Series established by the Bureau of Standards, and also discuss a microprojection method for measuring the individual particles of sulfur.

Of a total of 6 brands of fungicidal sulfur examined, the sieving method was successful in distinguishing 1 inferior brand, which contained 23 per cent by weight of sulfur that would not pass a No. 325 sieve. The other 5 brands passed 98 per cent or better through the same sieve, but by the microprojection method were found to vary greatly as to actual fineness. The extremes for the 5 brands on the basis of calculated weight were 74 and 96 per cent less than 27μ and 38 and 84 per cent less than 18μ. The importance of these determinations lies in the fact that sulfur particles larger than 27μ probably do not adhere to foliage.

The bacterial diseases of the bean: A comparative study, W. H. Burkholder (*New York Cornell Sta. Mem. 127 (1930), pp. 88, pls. 6, figs. 15*).—In presenting the results of an investigation of the bacterial diseases of the common bean (*Phaseolus vulgaris*), the author reports the recognition of six distinct diseases caused, respectively, by *Phytomonas phaseoli*, *P. flaccumfaciens*, *P. medicaginis phaseolicola*, *P. phaseoli fuscans*, *P. vignae leguminophila*, and *P. viridiflava*. The pathogenicity of each organism was proved by inoculation experiments, and the symptoms of each of the six diseases are described in full and compared as to their similarities and differences.

P. flaccumfaciens was found to be primarily a vascular parasite; *P. phaseoli*, *P. phaseoli fuscans*, and *P. medicaginis phaseolicola* might or might not be vascular parasites; *P. vignae leguminophila* under certain conditions was found in the xylem; but *P. viridiflava* was not found to be a vascular parasite.

The morphology and cultural characteristics of the several pathogenes are discussed. The host range for the pathogenes included over a dozen leguminous plants, including the common bean, Lima bean, cowpea, field pea, sweetclover, and alfalfa.

Control measures are suggested.

Clubroot of crucifers, F. L. Wellman (*U. S. Dept. Agr., Tech. Bul. 181 (1930), pp. 32, figs. 3*).—A detailed report upon studies of the life history of *Plasmodiophora brassicae* and control methods.

Spore germination was found to occur in a wide temperature range from about 6 to 27° C., with the peak at 25°. Disease development occurred in the range from 12 to 27°, with the optimum from 18 to 25°. The temperature ranges for the development of the disease and spore germination were practically identical, suggesting that the temperature range of the disease development is the direct result of the action of temperature on the parasite. Infection of the host plant occurred quite readily after 18 hours of exposure to infested soil of adequate moisture content, indicating that no drainage system could be expected to inhibit infection following heavy rains.

A range in pH of from 5 to 7.8 was found for 116 disease-infested soils. In a soil of pH 7.2, the addition of K_2CO_3 produced a pH of 8.1 without inhibiting the disease, whereas $Ca(OH)_2$ sufficient to change the pH to 7.3 completely prevented infection. Apparently H-ion concentration in itself was not a limiting factor in control. Limes consisting of $CaCO_3$ and $CaSO_4 \cdot 2H_2O$ were not satisfactory control media, while those of CaO or $Ca(OH)_2$ composition gave satisfactory control with plants grown in infested soils.

For satisfactory control in thoroughly infested seed beds, the author suggests applying at least 1,500 lbs. of hydrated lime per acre, while in the field at least 2 tons per acre were required to obtain commercially satisfactory control. Raw ground limestone was not effective, and air-slaked limes were of questionable value.

The Peronospora disease of hop [trans. title], F. Merkenschlager (*Gartenbauwissenschaft, 1 (1928), No. 4, pp. 467–470, pl. 1*).—This brief account of hop mildew (*Pseudoperonospora humuli*) deals rather generally with its history, spread, present distribution, variability, and control.

Studies of the breeding of sugar beets for resistance to curly top, K. Esau (*Hilgardia [California Sta.], 4 (1930), No. 14, pp. 415–440, pl. 1, figs. 8*).—Selection work in commercial fields and at Davis led to the development of sugar beet strains resistant to curly top. In one strain, designated as P19, consistent transmission of resistance was observed through five successive generations, with the result that a higher yield, a higher survival, and a higher average size of the roots were obtained than with commercial varieties. However, resistance was relative, varying somewhat with the severity of the exposure.

In respect to quality, the resistant P19 strain was found to be from 2 to 3 per cent lower in sugar content than commercial varieties grown under the same conditions, which fact combined with low viability of seed, low vigor, and undesirable shape of the root disqualified the strain commercially.

Crosses between P19 and another resistant strain yielded resistant seedlings of improved shape and vigor, and crosses between P19 and less resistant strains higher in sugar yielded resistant progenies with higher sugar content.

Mass selection for resistance to curly top in commercial plantings gave favorable results, but the progeny was less uniform in respect to resistance than P19. Mass-selected progenies had equally as high sugar content as did commercial controls.

Fungi parasitic on fruit trees in 1927 [trans. title], P. Voglino (*Ann. R. Accad. Agr. Torino, 70 (1927), pp. 53–58, figs. 2*).—Pathological and biological details are briefly given regarding attacks by several fungi on the plum, cherry, and almond.

"Blossom-wilt" of apple trees and "wither-tip" of plum trees, with special reference to two biologic forms of Monilia cinerea Bon., C. Boyle, M. Murphy, and H. A. Cummins (*Roy. Dublin Soc. Sci. Proc., n. ser., 19 (1928), No. 8, pp. 63–76, pls. 3*).—As the result of studies detailed with tabulation, it is stated that conidia taken from *M. cinerea* causing withertip of plums are larger than those of *M. cinerea* causing blossom wilt of apples when taken from a dead spur, whereas these results are reversed in the case of conidia produced on culture media. Either form sporulates at from 8 to 26° C., but neither at 32°. Sporulation is better in the case of the withertip Monilia. In both fungi, sporulation increases as the temperature lowers to an apparent maximum at the lowest temperature available, from 9 to 6°. The differences between the two Monilias are outlined.

All sprays tried proved ineffective for control, the best results being obtained by removing and burning diseased spurs and trusses.

Pecan leaf blotch, J. B. Demaree and J. R. Cole (*Jour. Agr. Research [U. S.], 40 (1930), No. 9, pp. 777–789, figs. 5*).—In this study of the life history and control of the pecan leaf blotch, caused by *Mycosphaerella dendroides* n. comb., a disease known to occur on the pecan in Georgia, Florida, Alabama, Mississippi, Louisiana, and Indiana, and on related hickories in South Carolina and Georgia, it was observed that the conidial stage of the fungus which attacks mature leaves of the pecan during the latter part of the season is apparently identical with *Cercospora halstedii* but different from *C. fusca*, another pecan parasite. The most conspicuous manifestation of the disease is groups and blotches of pycnidia and immature perithecia on the undersides of the leaf blades. The asci mature on the fallen leaves during the spring.

The relationship of the conidial and perithecial stages was suggested by their occurrence in the same lesions, by the similarity of cultures from either conidia or ascospores, and by the production of similar conidia and pycnidia in artificial cultures made from either conidia or ascospores.

Concerning control, orchard sanitation and the use of Bordeaux mixture or of monohydrated copper sulfate and lime dust are deemed effective. In the case of dusts, midsummer applications were the most important.

Diseases of rose caused by species of Coniothyrium in the United States, A. M. Waterman (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 9, pp. 805–827, figs. 12*).—Studies of the morphology and physiology of the fungi isolated from the three types of cankers occurring on the rose indicated that the brand-canker fungus is a different species of Coniothyrium from that causing stem and graft cankers. The brand-canker fungus was distinguished by the pronounced buffer tissue and papilla as well as the long ostiolar canal of its pycnidia, the size of its spores, and the grayish color of its mycelium in culture. Spore germination and the rate of growth in culture were relatively slow. Spores were produced by budding from the layer of cells lining the pycnidial cavity. The brand-canker fungus was able to infect rose and red raspberry cuttings through dormant buds and through wounds. Rose leaves and hips could not be inoculated. This fungus is identified as *C. wernsdorffiae.*

On the other hand, no morphological or physiological differences could be detected between the fungi isolated from the stem cankers and the graft cankers. In this case the spores were produced by budding, and both rose and red raspberry cuttings were successfully inoculated through dormant buds and through wounds, with the production of cankers. Rose hips but not leaves were infected by inoculation. The author believes that the stem and graft cankers are caused by a single species, which is designated as *C. fuckelii.*

Gloeosporium disease of oaks [trans. title], R. Laubert (*Gartenbauwissenschaft*, *1* (*1928*), *No. 4, pp. 463–466, fig. 1*).—A brief account is given of studies in the Dahlem Botanical Garden, particularly in 1928, showing that the Gloeosporium injury, which was marked in the case of *Quercus alba* and sometimes in *Q. stellata*, but less so in other oaks, may, under conceivable conditions become generally severe over wide areas.

Control of root-knot nematode in greenhouses, A. G. Newhall (*Ohio Sta. Bul. 451* (*1930*), *pp. 60, figs. 12*).—Stating that nematodes are a serious pest in Ohio vegetable greenhouses and even winter over in the adjacent soil outdoors, the author discusses various methods of control. The thermal death point in loam soil was found to be 118° F., with a 20-minute exposure. At the same time very little activity occurred in soils held at from 50 to 56°. Drying the soil in a warm greenhouse in shallow layers freed it of living nematodes in 8 days. Nematodes were found to a depth of 27 in. in sandy loam soil under glass.

Of over 30 chemicals tested as control media, none were entirely satisfactory, being more costly than steam. Hot water treatment of ground beds did not prove successful. Of the steaming methods, the inverted pan was fairly satisfactory when only one hothouse crop followed. Where two such crops were grown each year, buried pipe and tile were much more satisfactory. Buried tile was particularly worth while, reducing labor, producing killing temperatures at greater depths, and serving also for subirrigation. Steam was not directed successfully from an underground header much farther than 100 ft. in one direction or 75 ft. in each of two directions. Dry and loose soil was steamed most successfully, and a covering aided materially in retaining the heat.

Various physical, biological, and chemical relations, such as the lowering of the water-holding capacity by the destruction of soil colloids, death of certain bacteria, etc., involved in soil sterilization by the steaming process are considered. Excess soluble salts were removed by adequate drainage. Steam sterilization destroyed not only nematodes but also Fusarium wilt and other soil-harbored pathogenes and is considered profitable when the damage from these various factors exceeds 10 per cent.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Twenty-ninth report Connecticut State entomologist, 1929, W. E. Britton (*Connecticut State Sta. Bul. 315 (1930), pp. 479–620, pls. 16, figs. 15*).—This report (E. S. R., 61, p. 547) first presents the details of administrative work and notes on the entomological features of 1929, followed by Inspection of Nurseries in 1929 (pp. 502–516) and Inspection of Imported Nursery Stock (pp. 516–519), both by Britton and M. P. Zappe; Inspection of Apiaries in 1929 (pp. 519–529); Gipsy Moth Work in Connecticut in 1929, by J. T. Ashworth and Britton (pp. 529–543); The Cost of Spraying Woodland in Connecticut for the Control of the Gipsy Moth, by R. B. Friend and N. Turner (pp. 543–563); The Spread and Control of the European Corn Borer in Connecticut, by Britton and Zappe (pp. 563–568); Tests of Various Apple Sprays, by Zappe (pp. 569–571); A Study of Various Oils and Emulsions for Killing the Eggs of the European Red Mite (pp. 571–575) and Experiments with Oils on a Double Infestation of Aphids and European Red Mites at the Experiment Farm at Mount Carmel (pp. 576–578), both by P. Garman; Notes on Life History and Control of the Pine Leaf Scale, by Turner (pp. 578–581); The Mexican Bean Beetle in Connecticut, *Epilachna corrupta* Mulsant (pp. 581–585); Fuller's Rose Beetle in Connecticut, *Pantomorus godmani* (Crotch)=*Aramigus fulleri* Horn (pp. 585–587); An Outbreak of Small Aquatic Flies in a Filter Plant, by B. H. Walden (pp. 587, 588); The Japanese Beetle: Scouting and Quarantine Enforcement, by Britton and J. P. Johnson (pp. 588–599); The Asiatic Beetle: Quarantine and Inspection (pp. 599–603); The Revised Insect Pest Law (pp. 604, 605); Spread of the Satin Moth (pp. 605, 606); The Asiatic Garden Beetle in Connecticut, *Aserica castanea* Arrow (pp. 607, 608); Mosquito Control in Connecticut in 1929, by R. C. Bostford (pp. 608–613); and Miscellaneous Insect Notes (pp. 614–617).

There was a marked western spread of the European corn borer in the State in 1928, 34 new towns being found infested. All except Suffield were connected with the large infestation of the double brooded corn borer which extends from the east, Suffield having been found infested with the one-generation or single-brooded area that has extended into western Massachusetts from New York.

In testing various apple sprays, Zappe found that the dry lime sulfur and the liquid lime sulfur were about equal in efficiency, but the fruit from the dry lime sulfur plat had a better finish. The sulfocide-scalecide treatment was very good, showing a higher percentage of good fruit in three of the four varieties used in the tests. Basing the conclusions on one year's work in Connecticut, iron sulfate has no advantage over any of the standard sprays, but needs further investigation.

As a control for the European red mite, it was found that heavier oils were more effective than light when emulsified on the same formula. An emulsion with large oil globules is slightly more effective than one with small globules. The differences obtained are, however, doubtfully important. Fuel oil added to lubricating oils lowers their toxicity for red mite eggs. Oils dissolved in gasoline may be used to compare different oils of the same or different properties. There was some indication that the addition of lime sulfur to stabilized emulsions increases the kill.

Turner found no indication that any of the first brood eggs of the pine leaf scale carried over until fall. In combating the first brood nicotine sulfate, 1 part in 500 parts of water with 1 per cent soap, or white oil (1 per cent) should be applied about June 1 in southern Connecticut. Where sprays for the second brood are required, one application of the white oil or two applications of the nicotine sulfate should be made, one about August 1 and for the nicotine spray again August 15.

The Mexican bean beetle made its appearance in the State for the first time, having been detected at Stamford in July and later in 17 towns and cities in four counties in the western half of the State.

Two nonbiting flies, *Chaoborus punctipennis* Say. and *C. trivittatus* Loew, which caused annoyance in the control room of a filter plant, were found breeding in the reservoir.

In the course of scouting work during the winter of 1928–29 for gipsy moth eggs, the satin moth was found to be well scattered over the eastern part of the State and in Hartford and Suffield west of the Connecticut River. The Asiatic garden beetle, *A. castanea*, was found during 1929 in the towns of Cromwell, Manchester, Mansfield, New Canaan, and Southport.

[Work in economic entomology at the New Mexico Station] (*New Mexico Sta. Rpt. 1929, pp. 31–35, 36–39*).—This report of work of the year (E. S. R., 61, p. 247) deals in particular with codling moth investigations. In testing attractant baits for trapping the moths, malt sirup diluted with water at the rate of 1 part to 10 and table molasses also diluted with water at the same rate gave the largest and most consistent catches during the season, although not sufficient to be effective as a means of control. Geraniol was added to some of the baits and increased catches of the codling moths were immediately obtained, but owing to lateness of the season it was not sufficiently tested to permit of definite conclusions. Data obtained during the past two seasons showed that adults of the first generation in 1928 were most active from April 18 to April 20 and again from May 8 to May 15 and that in 1929 they were most active from April 19 to April 24 and from May 5 to May 15.

In experimental work with poisoned bands and banding materials, the details of which are presented in tabular form, the bands of corrugated paper captured more larvae than did those of burlap sacking or crêpe paper, and this superiority prevailed regardless of whether the bands were untreated or treated with a poison to kill the larvae. A narrow band of beta naphthol-treated corrugated paper 2 in. wide did not catch as many larvae as did a band 6 in. wide treated with the same material. The beta naphthol-engine oil treatment applied to either corrugated or burlap bands was superior in its killing effect on the larvae to all of the other materials tested, killing from 60 to 90 per cent.

Derris and pyrethrum soap emulsion proved unsatisfactory, the former acting as a repellent and the latter killing but 15 to 23 per cent of the larvae. Several soil insecticides or fumigants effective in controlling woolly aphis were also tested. The larvae were allowed to spin in corrugated paper bands placed on the tree trunks about 6 in. above the ground, and a mound of earth was thrown up sufficiently high about each trunk to cover the band. Paradichlorobenzene used at the rate of 6 oz. per tree caused a mortality of 88.8 per cent, as did calcium cyanide used at the rate of 8 oz. per tree, while carbon disulfide at the rate of 12 oz. per tree caused a mortality of 92 per cent.

Observations of the rate of pupation of overwintering larvae in corrugated paper bands in the orchard during the spring of 1928 showed that 6 per cent had pupated as early as March 10, 16 per cent were in the pupal stage on March 30, 43 per cent on April 20, and 91 per cent on May 10. In the observation of emergence in field cages from similar bands, commenced April 1, two distinct waves of adult emergence were found to occur, the first taking place April 23 to May 1 and the second from May 8 to May 30.

In work with the San Jose scale, a further study was made of the various emulsifiers for cold-mix oil emulsions. It was found in field tests during 1927 and 1928 that the standard Kayso red engine oil emulsion, using lubricating oil 4 gal., Kayso 4 oz., and water 100 gal., gave a satisfactory control. None of the emulsifiers tested, the details of which are presented in tabular form, gave both a lower rate of demulsibility and a smaller range in drop size than did Kayso.

A brief reference is made to outbreaks of several truck and field crop pests that occurred during the year and also to the life history of the giant apple root borer, an account of which pest by Crawford and Eyer has been noted (E. S. R., 60, p. 64).

A study was made of the spring migration of the beet leafhopper adults to seed beets and to several different plantings of field beets in 1929 as ascertained by weekly surveys from April 17 to October 5, the results of which are presented in tabular form. During the season adults first appeared at State College on seed bed beets about April 15 and increased in abundance until the last of June. Nymphs of the first generation on beets were observed to begin hatching about May 16 and became quite abundant by the first of June. Following the rainy period, which commenced about July 1, adults of the first generation began leaving the beet fields to feed on a number of wild host plants, particularly Russian thistle and pepper grass.

A number of parasites of the hymenopterous families Mymaridae and Trichogrammatidae were reared from sugar beet plants on which ovipositing females of the beet leafhopper were caged. Three of these have been tentatively determined as *Polynema eutettixi* Girault, *Anagrus giraulti* Crawford, and *Abbella subflava* Girault. Reference is also made to Mediterranean fruit fly activities.

[Report of work in entomology at the Texas Station] (*Texas Sta. Rpt. 1929, pp. 41–47, 103, 104, 146, 147*).—A brief reference is first made to observations on ingestion of poison by the cotton boll weevil and on the cotton flea hopper, reports of work with which pests have been noted (E. S. R., 59, pp. 58, 556; 62, p. 651). Hibernation studies with the flea hopper indicate that injury to cotton may be expected whenever the emergence is abundant and when the large proportion hatch after cotton comes up. The emergence of the boll weevil up to June 22, when the last of 5,000 in hibernating cages emerged, was 8.83 per cent.

Investigations of the cotton bollworm conducted in cooperation with the U. S. D. A. Bureau of Entomology led to the conclusion that the adult moths usually transfer their egg laying activities to cotton about the time 70 per cent of the corn ears have dried silks. The growers should look closely for infestation in the cotton field shortly after this time and be prepared to poison if necessary. In an attempt made to determine the reasons for the varying degrees of infestation in cotton within limited areas, it is indicated that cotton is not the most preferred host plant of the bollworm. In extensive control experiments promising results were obtained, indicating that arsenicals may be used to good advantage under conditions of heavy bollworm infestation such as occurred in 1929. All of the 14 plats dusted with arsenicals averaged together showed an increase of 309 lbs. of seed cotton per acre over the average yield of the 7 check plats, which was 581 lbs. of seed cotton per acre.

In combating the turnip aphid, on which a 40 per cent nicotine sulfate solution was used, 1 part to 800 of water gave very encouraging results when thoroughly applied at a pressure of 75 lbs. In an endeavor to obtain a greater degree of control, a nicotine solution was used containing 50 per cent nicotine and the results obtained were even more promising. Trials with heated sprays indicate that a much greater degree of control can be obtained than with cold sprays, and that such sprays will probably be more practical than heated dust.

In combating the boll weevil at the Beeville Substation, three applications of calcium arsenate dust applied at the rate of 5 lbs. per acre at 5-day intervals gave good control and permitted the production of ½ bale of cotton to the acre as compared with ¼ bale on near-by fields that were not poisoned.

In control work at the Weslaco Substation with the bean leafhopper on snap beans, Bordeaux spray with nicotine or with oil emulsion (1 per cent) gave a more satisfactory control than did copper-lime dust or sulfur dust or Bordeaux alone. Oil emulsions made from highly refined oils of low volatility were more effective against turnip aphids than were repeated applications of nicotine dust. Oil emulsion sprays reduced the infestation of onion thrips temporarily, but did not give effective control. Arsenate of lead spray with soap spreader was more effective against leaf worms on cabbage than was calcium arsenate dust. One lime-sulfur spraying of citrus in April and oil emulsion sprays applied in May and July or June and August were very effective against rust mites and scale insects. Control work with red scale showed May and July applications of oils to be somewhat more effective than oils applied at other times. The application of lime sulfur at monthly intervals failed to show any measure of control for red scale.

In observations of the reproduction of the California red scale, 13 mature female red scales early in the season gave birth to an average of 50.7 young per female over an average period of 29 days. The maximum young per period was 127, minimum 20. The days of production varied from a maximum of 44 to a minimum of 12. The first young were taken on April 8. The majority of young during normal weather conditions in this section, and where there is not overcrowding, emerge during the early hours of the morning and settle within two hours after emerging. During rainy weather the young do not emerge in great numbers, but remain beneath the mother scale until conditions are more favorable. The host plants of red scale now include avocado, salt cedar (*Tamarix* sp.), citrus, oleander, euonymus, wax-leaf Ligustrum, mulberry, Amoor River privet, and English ivy.

The yellow scale, a close relative of the red scale, has been found infesting citrus, castor-bean, and English ivy. Two parasites, namely, *Prospaltella aurantii* How. and *Aphelinus chrysomphali* Mercet., have been reared from the yellow and red scales, respectively. It is concluded that rust mites on citrus can be effectively controlled by the use of sulfur in its various forms. A spray of lime sulfur and two sprays of oil emulsion, one in May and one in July, resulted in grapefruit commercially free of scale insects and rust-mite damage.

[Notes on economic insects and control measures] (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 286–290*).—The notes on economic insects are as follows: *Aphelinus mali* in Brazil, by L. O. Howard (p. 286); A Note on the Food Habits of *Chyliza erudita* Mel. (Diptera), by L. P. Wehrle (p. 286); A New Pupal Parasite of the Sugar Cane Moth Borer, *Diatraea saccharalis* Fabr., by J. N. Roney (pp. 286, 287); A Parasite of the Sunflower Weevil, by J. H. Bigger (p. 287); Nitidulid Beetle Reared from Orange, by E. O. Essig (p. 287); Notes on *Trichogramma minutum* Riley as a Parasite of *Acrobasis caryae* Grote, by C. B. Nickels and C. C. Pinkney (pp. 287, 288); Hibernation of the Convergent Lady Beetle, *Hippodamia convergens* Guer., on a Mountain Peak in New Mexico, by J. R. Douglass (p. 288); Note on a New Method of Determining Efficiency in Control, by W. Middleton and F. F. Smith (p. 289); and Suggestions for Use of Oil Sprays in 1930, by E. J. Newcomer and A. Spuler (pp. 289, 290).

Some tendencies in modern economic entomological research, T. J. HEADLEE (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 28–35*).—This is the presidential address presented at the annual meeting of the American Association of Economic Entomologists held at Des Moines, Iowa, in December, 1929.

Some devices for handling insects, G. WISHART (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 234–237, figs. 4*).—A new apparatus for handling adult insects by use of air currents was developed in connection with the breeding and handling of parasitic insects and their hosts at the Dominion Parasite Laboratory, at Belleville, Ontario.

A proposed basic definition for commercial control, V. I. SAFRO (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 162–164*).—Commercial control is defined as the measure of protection from insect attack that yields the maximum net return at the minimum expense.

Improvements in spraying equipment, A. F. BURGESS (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 132–136, pl. 1, fig. 1*).—In discussing the development of high-power machinery used in the gipsy moth control work, reference is made to the recent construction of a power take-off for light motor trucks which has been operated for one season with excellent results. It is pointed out that working pressures up to 1,000 lbs. can be used where hose lines of 6,000 ft. are required.

The relation of the surface tension of some spray materials to wetting and the quantity of lead arsenate deposited, C. C. HAMILTON (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 238–251, figs. 6*).—In work conducted by the New Jersey Experiment Stations the spreader materials tested were powdered skim milk plus lime, flour plus lime, saponin, casein plus lime, and glue. Data and charts are given showing the surface tension curves, time required to wet clean glass plates and wax coated glass plates, and the quantity of lead arsenate deposited when the spreader materials mentioned above were used at varying concentrations.

Some notes on dusting cucumbers, P. J. CHAPMAN and G. E. GOULD (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 197–202*).—Preliminary tests made by the Virginia Truck Experiment Station in 1929 showed that cucumber plants dusted for control of cucumber beetles and downy mildew while wet from dew averaged smaller (yielded less in case of downy mildew) than those treated while dry. The dusts include hydrated lime, gypsum, these two with calcium arsenate, sodium fluosilicate, calcium fluosilicate, and copper lime.

Penetrol as an activator for nicotine, J. L. HOERNER (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 174–177, pl. 1*).—Penetrol, a sulfonated oxidation product of petroleum, shows definite activation properties when used with nicotine and does away with the disadvantages of soap.

Results from the use of nicotine in the control of sucking insects on potatoes on Long Island, H. C. Huckett (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 169–174*).—This is a brief discussion of the efficacy of the average sprayer and duster under local conditions in combating aphids and leafhoppers with nicotine mixtures, as indicated by reduction in aphid population, condition of foliage with reference to hopper burn, and yield of tubers.

Carbon dioxide as an aid in the fumigation of certain highly adsorptive commodities, R. T. Cotton (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 231–233*).—The author found that the fumigation of highly adsorptive commodities, such as nut meats, in vacuum is greatly facilitated by the admixture of carbon dioxide with other gases.

Ethylene oxide as a fumigant for food and other commodities, E. A. Back, R. T. Cotton, and G. W. Ellington (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 226–231*).—"Ethylene oxide, a recently discovered gas, is an excellent fumigant for all types of foodstuffs. When used as directed with carbon dioxide it is nonflammable and nonexplosive, easy and safe to use, effective against all types of stored product insects, and is reasonably inexpensive. It has been used successfully in treating stores, supply rooms, grain bins, fumigating vaults, etc. Dosages for the atmospheric and vacuum fumigation of various commodities are given."

The economic importance of shade tree insects, E. P. Felt (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 109–113*).—A brief general discussion.

Shade tree insects in 1929, E. P. Felt and S. W. Bromley (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 137–142*).—An account of the more important insect enemies of shade trees in 1929.

The meadow grasshopper, Orchelimum vulgare Harris, a new raspberry pest, C. L. Metcalf and A. S. Colby (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 97–108, pl. 1*).—*O. vulgare*, not hitherto reported as destructive to raspberry, did much damage by ovipositing in canes of Illinois plantations adjoining crops of clover, cowpeas, and alfalfa in 1928 and 1929. Egg-laying scars, oviposition, hatching, and molting are described. Cultural and mechanical control measures are suggested. An egg parasite is recorded.

Leafhopper association on apple, W. J. Schoene (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 177–181, figs. 2*).—This contribution from the Virginia Experiment Station reports briefly upon life history studies and field observations of the leafhoppers in Virginia apple orchards. Serious injury to fruit and foliage has resulted from the feeding of six species. The seasonal abundance of *Empoasca fabae*, *E. maligna*, *Typhlocyba pomaria*, *Erythroneura hartii*, *E. obliqua*, and *E. dorsalis* are given, and the life history of the last three species at Blacksburg, Va., are shown in chart form.

Toxicity of sprays and spray ingredients on pear psylla nymphs, F. Z. Hartzell (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 190–197*).—Experiments were conducted by the New York State Station on nymphs of the pear psylla with various combinations of the following ingredients: Bordeaux (2–40–100), nicotine sulfate, free nicotine, Derrisol, M-P Insecticide, white petroleum oils, pine oil, hardwood neutral oil, and Penetrol. The trials were made in commercial orchards, using a large spray rig.

"All the ingredients showed toxicity toward psylla nymphs at the various strengths used. The percentage of dead nymphs varied directly with the proportion of white oil, but nicotine (1–3,200) showed a certain toxicity which appears to be but slightly increased by larger dosages. The several ingredients when mixed seemed to increase the destructiveness of the resultant mixture by an amount equal to the sum of the specific toxicities of the components. It is indicated that the nicotine content of psylla nymph sprays can be considerably reduced, provided other toxic materials are added which do not react unfavorably with the nicotine. The percentage of white oil can be reduced in the spray mixtures if nicotine in pine oil or hardwood neutral oil be added. Pine oil and hardwood neutral oil show promise of reducing materially the nicotine content of the regular spray. Penetrol in Bordeaux with reduced nicotine dosage was tested the most extensively, and appears to be safe to foliage during the spring application if normal temperatures prevail."

The rosy aphid in relation to spray practices, P. J. PARROTT and H. GLASGOW (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 182–184*).—The authors describe experiments carried out with lime sulfur, Bordeaux mixture, and oil emulsions containing nicotine extracts to control the rosy apple aphid. It is concluded that the newly hatched nymphs are susceptible to timely applications, preference being given to lime sulfur and nicotine sulfate at standard strengths.

Further studies on the problem of reducing the nicotine unit charge of nicotine, R. S. FILMER (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 165–169*).—The results of laboratory and field tests at the New Jersey Experiment Stations show that the unit charge of nicotine toxic to aphids is reduced to 1–4,800 actual nicotine when 0.5 per cent sodium oleate is used in the spray mixture. *Aphis spiraecola*, *A. rumicis*, *A. sorbi*, and the black cherry aphid were controlled in the laboratory with 0.5 per cent of sodium oleate plus 1–5,000 actual nicotine. In orchard tests the apple aphid and *A. sorbi* were controlled with 6 lbs. of commercial oleate (40 per cent water) plus ⅛ pint of Blackleaf 50 per 100 gal. This concentration is equivalent to 0.5 per cent soap plus actual nicotine 1–4,800.

Parlatoria oleae Colv., a pest of privet in Maryland, H. S. McCONNELL (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 142–144, pl. 1*).—The establishment of this scale pest in Maryland is recorded, and preliminary notes are given on its life history, habits, natural enemies, and means of control.

The gypsy moth outbreak in southern Quebec, L. S. McLAINE (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 38–41*).—In the eradication of the gipsy moth outbreak, first detected at Henrysburg in southern Quebec in 1924, 2,908 egg clusters were found, the last in 1926.

Rearing codling moth larvae throughout the year (Carpocapsa pomonella), M. D. FARRAR and W. P. FLINT (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 41–44*).—A method is described by which it has been found possible to rear large numbers of codling moth larvae at any time during the year that they may be desired for laboratory tests.

Some substitutes for arsenic in control of codling moth, T. J. HEADLEE, J. M. GINSBURG, and R. S. FILMER (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 45–53*).—Work conducted at the New Jersey Experiment Stations led to the conclusion that either white oil pyrethrum or nicotine tannate can be employed for the destruction of codling moth with as high a measure of control as can the arsenic sprays, and, further, that these materials have in them the promise of reasonably and perhaps completely adequate substitutes for the control of codling moth in the place of arsenical sprays when used during the period of entry by the larvae of that insect. It is pointed out, however, that much further work must be conducted before they can be recommended for practical use.

Further experiments with nicotine-oil for the control of the codling moth in the Pacific Northwest, M. D. LEONARD (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 61–75, fig. 1*).—Experiments conducted in the Pacific Northwest during the season 1929 by a commercial company in cooperation with several leading oil spray manufacturers are reported upon. The results, in general, are considered to substantiate those obtained in 1927 and 1928 (E. S. R., 61, p. 252) further indicating the value of the nicotine oil combination in the general apple spray schedule in the Northwest.

New combination sprays for codling moth control, A. Spuler and F. P. Dean (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 53–61, figs. 7*).—The Washington Experiment Station finds that lead arsenate is not an effective spray treatment for the second brood of the codling moth. From 40 to 50 per cent of worms placed on apples sprayed with lead arsenate 2–100 entered the fruit unpoisoned. The addition of mineral oils of medium to high viscosity to lead arsenate greatly improved the insecticidal value of the lead arsenate. This combination spray has an ovicidal value of from 80 to 95 per cent and a larvicidal value much greater than that of lead arsenate alone. Fish oil is even more effective than mineral oils in increasing the insecticidal value of lead arsenate. The nicotine oil combinations have proved as effective as lead arsenate when applied in the cover sprays for the first brood and decidedly more effective if applied in the second brood sprays. All combination sprays of mineral oils with lead arsenate or nicotine sulfate are most effective if applied during the periods of maximum egg laying. Because of cleaning difficulties, combinations of mineral or fish oils with lead arsenate should be applied in first brood sprays and the mineral oil-nicotine sulfate combination in second brood sprays.

Certain factors influencing oriental fruit moth infestation, R. B. Neiswander and L. A. Stearns (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 75–80, figs. 5*).—The statistical interpretation of data accumulated in experimental orchard spraying in Ohio during 1929 for control of the oriental fruit moth (*Laspeyresia molesta* Busck) indicates that peach tree vigor as evidenced by twig length and weight is distinctly correlated with the number and percentage of injured twigs; furthermore, that a similar correlation exists between total fruit and the number and percentage of visibly injured fruit. Such influencing factors should be given adequate consideration in planning and in evaluating the results.

Experiments against wintering larvae of the oriental peach moth, Laspeyresia molesta Busck, J. W. Lipp (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 205–208*).—The author reports upon experiments in control work with the overwintering larvae of *L. molesta* conducted during the dormant seasons of 1927–28 and 1928–29. The larvae were permitted to make hibernacula on sticks cut from pear limbs, which were then hung in an outdoor cage. Toxicity was determined by the number of moths emerging from sprayed and unsprayed sticks. Late fall spraying and early spring spraying produced approximately the same results, none of the solutions tested giving a mortality greater than 67 per cent.

Oriental peach moth control studies in 1929, P. Garman (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 203–205*).—Field experiments in control of the oriental peach moth, *Laspeyresia molesta*, in 1929 showed no control for talc dust and slight reductions for lime and oil combinations. Laboratory ovicide experiments under insectary conditions showed a good kill for oil preparations, particularly oil and pine oil combinations.

Recent experiments on oriental peach moth control in New Jersey, B. F. Driggers (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 209–215*).—In work by the New Jersey Experiment Stations "nicotine sulfate and white oil emulsions failed to control the oriental peach moth, *Laspeyresia molesta*, when these sprays were used against the first brood eggs and larvae. Two years' spraying tests with pyrethrum-impregnated white oil emulsions used at 1 per cent or less failed to control the oriental peach moth when these sprays were applied to coincide with the appearance of third brood eggs and larvae. Talc dust applied at the time the third brood eggs were hatching gave a partial control of the peach moth in two orchards. In a third orchard the talc dust was found to prevent the work of the egg parasite, *Trichogramma minutum*, and no control was obtained. Experiments in 1928 and 1929 showed that larval parasitism by *Macrocentrus ancylivora* could be increased in young orchards in North Jersey by the liberation of this parasite during June, July, and August."

Studies of bait traps for the oriental fruit moth in southern Indiana in 1929, W. P. YETTER, JR. (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 85–91, pls. 2*).—The work conducted in southern Indiana with baits for the oriental fruit moth (*Laspeyresia molesta* Busck) has thus far been of a preliminary nature, but the results point to certain possibilities. Various aromatic chemicals when used in solutions of blackstrap molasses or granulated sugar gave good catches. Boiled peach juice shows promise. The use of a screen of 0.25-in. mesh over the mouth of the bait promises to make these traps more efficient.

Hydrated lime in summer sprays for the control of the oriental fruit moth.—A second report, L. A. STEARNS and R. B. NEISWANDER (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 81–85, figs. 2*).—The results of laboratory tests under both cooperative and experimental orchard spraying conducted in Ohio during 1929 substantiate the preliminary data of 1928 (E. S. R., 62, p. 248), and emphasize further the belief that a probable summer control of the oriental fruit moth (*Laspeyresia molesta* Busck) may result through a succession of early season sprays which will include hydrated lime or some like materials acting as a physical or mechanical hindrance to oviposition, hatching, and larval entry.

Oriental peach moth parasite work in New York, D. M. DANIEL (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 215–217*).—This is a report of the results of two years' experiments by the New York State Experiment Station in colonizing *Macrocentrus ancylivora* Roh. in the area of new infestation of the oriental peach moth (*Laspeyresia molesta* Busck) in western New York. "The parasite has apparently established itself in this region. *Glypta rufiscutellaris* Cress. and *Ascogaster carpocapsae* Vier. were found to parasitize the peach moth in western New York in 1927, although the percentage of parasitism was negligible. In 1928 Glypta parasitized 12 per cent of the larvae of the peach moth and in 1929 only 0.71 per cent. In both of these years Ascogaster was of rare occurrence. In 1929 twig collections from the Hudson Valley and Long Island showed a parasitism by Macrocentrus of 51 and 89 per cent, respectively. Seven hundred thousand *Trichogramma minutum* Riley liberated in one orchard parasitized 36 per cent of the season's eggs."

Notes on the southwestern corn borer, Diatraea grandiosella Dyer, C. J. TODD and F. L. THOMAS (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 118–121*).—It is reported that the southwestern corn borer, which has been causing considerable injury to corn, was found infesting several grain sorghums in part of the panhandle of northwest Texas.

Notes on the pistol case-bearer, L. M. PEAIRS and E. GOULD (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 188–190*).—This is an account of an unusual outbreak of the pistol case-bearer in the eastern panhandle of West Virginia which the ordinary orchard spray practice of the region failed to control. Tests of different insecticides showed nicotine sulfate with Penetrol to be most effective, when applied just after the hatching period.

A method of securing eggs of the Angoumois grain moth, G. W. ELLINGTON (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 237, 238, pl. 1*).—This is a description of an apparatus used to obtain eggs of the Angoumois grain moth in large numbers.

The European corn borer with respect to sweet corn in New York, G. E. R. Hervey (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 154–157*).—A brief account of the status of the European corn borer in New York, contributed by the New York State Experiment Station.

A preliminary report on the control of the pine tip moth, Rhyacionia frustrana (Comstock), F. F. Smith, H. J. Fisher, and T. L. Guyton (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 113–118*).—Various control measures, some of which were applied to the egg stage, were found to be practical in combating the pine tip moth (*R. frustrana*), which is established in certain small pine plantations and is a serious pest in evergreen nurseries in Pennsylvania.

Observations on a new apple mining caterpillar in Missouri, L. Haseman (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 91–94, pl. 1*).—This is a report of observations on the distribution, life cycle and habits, and presence in great abundance of a small maggot-like caterpillar of the genus Carposina. This has caused some damage to apples in central Missouri during the past two years by making a serpentine mine or tunnel under the peeling.

Progress in the utilization of Trichogramma minutum in cane borer control in Louisiana during 1929, W. E. Hinds and H. Spencer (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 121–127*).—This is a further progress report of breeding and field colonization work with the egg parasite *T. minutum* (E. S. R., 62, p. 252) as a means of controlling the sugarcane borer.

Bacterial wilt disease, F. M. Brown (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 145, 146*).—No real success was met with by the author in his efforts to infect artificially healthy colonies of the eastern tent caterpillar with wilt disease caused by *Staphylococcus flaccidifex* of known pathogenic character.

The efficiency of various insecticides in controlling the bud moth, S. W. Harman (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 184–187*).—A report of studies conducted by the New York State Station on the eye-spotted bud moth, which is a major apple pest in certain sections of western New York. Severe infestations are capable of defoliating orchards and destroying the crop. There are two periods when effective treatment may be practiced, namely, early in the spring when the overwintering larvae become active and during the summer when the eggs are hatching. In heavily infested orchards nicotine was the only material used to which the overwintering larvae were noticeably susceptible. Lead arsenate was apparently of little value early in the season, but in the summer during the egg hatching period thorough applications of either lead arsenate or nicotine were effective.

The effect of talc on the oviposition of a trypetid, R. C. Burdette (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 260–265*).—In work at the New Jersey Experiment Stations talc when dusted on pepper plants materially reduced the oviposition of the pepper maggot fly (*Spilographa electa*) in the pepper fruit. The talc acted on the fly either as a repellent or as a mechanical barrier to oviposition. Failure to maintain a coating of the talc on the plants when the fly is on the wing results in a prompt increased infestation in the peppers.

The value of smudges as repellents for the Japanese beetle, F. W. Metzger (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 278–281, pl. 1*).—A description is given of the preparation of one type of smudge base and its impregnation with various volatile substances. The field tests with these smudge candles are discussed and conclusions drawn as to their practical value as repellents.

The establishment and colonization of Tiphia popilliavora, a parasite of the Japanese beetle, J. L. King and J. K. Holloway (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 266–274, figs. 2*).—The parasite here considered was introduced from Japan in 1921–1923 and established in beetle infested areas. By 1929 the parasite was very abundant in the mother colony center at Riverton, N. J., and it was decided to place as many colonies in the field as could be obtained. Seven collectors working during a 17-day collecting period were able to collect 10,100 females. These were placed in 101 colonies of 100 females each on the margins of the heavily infested beetle area. At the time of writing there were 134 colony centers established throughout the infested region. A small number of test releasements were also made in the areas infested with *Phyllopertha orientalis* at Long Island, N. Y., and New Haven, Conn.

Some phases of the Mexican bean beetle campaign, E. N. Cory, P. D. Sanders, and W. T. Henberry (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 146–149*).—A general account of control work with the Mexican bean beetle in Maryland.

An electrical trap for killing Japanese beetles, F. E. Mehrhof and E. R. Van Leeuwen (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 275–278, pls. 2, figs. 2*).—This is a review of the results of a two-year effort to construct and develop an electrical trap for use against the Japanese beetle and of the results of field experiments.

Plowing as an aid in Mexican bean beetle control, P. J. Chapman and G. E. Gould (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 149–154*).—In several tests made by the Virginia Truck Experiment Station it was found that plowing may be effective in destroying the Mexican bean beetle, especially the immature stages. Notes on the longevity and food habits of beetles unfed since emergence are included.

Some observations upon the biology and control of Aserica castanea Arrow, H. C. Hallock (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 281–286, figs. 2*).—An account of the life history of and means of control for the orchard garden beetle. A spray of lead arsenate on the food plants of the adult beetle proved effective. The introduction of parasites to aid in its control has been commenced.

Fidia longipes as a grape pest, D. Isely (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 95–97*).—A summary is given of the life history and habits of *F. longipes*, which has replaced the grape root worm in importance in the grape belt of Arkansas.

The effect of pyrethrum extract on wireworms and upon plants infested by them, T. J. Headlee (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 251–259*).—It was found by the New Jersey Experiment Stations that a mixture of pyrethrum extract and soap can be used to destroy wireworms without injuring the plants on which they are feeding. Soils through which this mixture penetrates affect the toxicity of both the pyrethrum extract and the soap. This reduction in toxicity is least when the soil is composed exclusively of sand and increases as the clay component becomes larger.

The plum curculio outbreak in the Charlottesville-Crozet section of Virginia in 1929, L. R. Cagle (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 157–162, fig. 1*).—In this contribution from the Virginia Experiment Station an attempt is made to explain the heavy losses from curculio in the Charlottesville-Crozet section. It is believed that the important factors were the omission of the petal-fall spray, lack of thorough cultivation, and heavy rainfall in the early season.

[Report of apicultural work at the Texas Station] (*Texas Sta. Rpt. 1929, pp. 92–95*).—In work on the behavior of bees, it was shown that the tendency of the moisture content of the air within the hive is to approach a normal of 70° F. Bees can endure an outside temperature of 110° and a monthly mean temperature of 46° without as great a loss of bees and use of stored honey as is experienced during the warmer winters. The results indicate that the store of honey used during the summer quiescent period is greater than necessary, and that the store of honey during the winter period is in direct ratio to the number of times of making and breaking the winter cluster. In referring to honey plants, it is stated that horsemint plants when 8 years old appear to reach a stage where they are no longer a paying crop. In queen breeding, reference is made to a colony that produced one-eyed bees and another colony that produced mixed sex characteristics. A brief reference is also made to bee products, bee relationships, diseases and losses, and distribution of honey production.

Bees for the orchard, E. F. Phillips (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 218–223*).—The requirements for colony strength in order that bees give good service in pollination of fruit are considered, and the danger to bees from the dusting of poisonous materials is discussed.

A practical honeybee shipping cage for use in pollination, R. Hutson (*Jour. Econ. Ent., 23 (1930), No. 1, pp. 223–225*).—Observations made by the New Jersey Experiment Stations on a shipping cage designed for use as a hive in the orchard indicate that it is possible for bees to be prepared at the shipping point for use in orchards. Bees so prepared, shipped, and used compare favorably with packages hived in the orchards as to shipping, handling, and salvage value.

ANIMAL PRODUCTION

Vitamin work (*Texas Sta. Rpt. 1929, p. 14*).—In this study it was found that yellow corn contained one unit of vitamin A in from 0.15 to 0.35 gm., while white corn had less than one unit in 18 gm. Strawberry corn had about one unit in from 0.7 to 1 gm. Yellow corn usually contains about as much vitamin A as alfalfa leaf meal, and more than orange peel and pulp. Dried sweetpotatoes contained one unit of vitamin in about 0.4 gm. That climatic and soil conditions affected the composition of corn was indicated by the fact that the protein content in the same variety varied from 8 to 12 per cent in different localities.

Cattle feeding investigations, 1927–28, B. M. Anderson, C. W. McCampbell, and M. A. Alexander (*Kansas Sta. Circ. 151 (1929), pp. 20, fig. 1*).—Continuing these studies (E. S. R., 61, p. 159), the results reported are divided into 4 parts, parts 1 and 2 being by Anderson and Alexander.

I. *The value of adding ground limestone to rations fed calves being fattened for market.*—Eight lots of 9 or 10 steer calves, each averaging 373 lbs. per head, were fed for 180 days. Ground corn and cottonseed meal were fed to each of the first four lots, and shelled corn, cottonseed meal, and cane silage to each of the last four lots. In addition alfalfa hay, alfalfa hay and ground limestone, prairie hay, and prairie hay and ground limestone were fed to the respective lots in each series of 4. The grain was hand-fed twice daily the first 60 days and then self-fed. The average daily gains in the respective lots were 2.46, 2.44, 2.15, 2.25, 2.32, 2.49, 2.07, and 2.43 lbs. per head.

Based on the daily gains and cost of gains, it did not pay to add ground limestone to a ration the entire roughage portion of which was made up of alfalfa hay. However, where the roughage ration was prairie hay the addition of limestone increased the rate of gain and the selling price of the steers, but had no effect on cost of gains. Even with the addition of ground limestone, prairie hay was not so valuable as alfalfa hay. When the roughage portion of the ration consisted of silage and alfalfa hay, the addition of ground limestone increased the rate and economy of gains and the selling price per hundredweight, and such a ration gave decidedly better results than the standard ration of corn, cottonseed meal, silage, and alfalfa hay.

II. *Full feeding v. feeding a light grain ration for a limited period and then full feeding in the case of yearlings.*—Yearling steers averaging 699 lbs. per head were divided into 2 lots of 10 head each. Lot 1 was put on a full feed of ground corn as quickly as possible, while lot 2 was limited to 5 lbs. of corn for 90 days and then full fed. The remainder of the ration consisted of cottonseed meal, cane silage, and alfalfa hay in both lots. The cattle were appraised at the end of 150 days and again at the end of 225 days.

The average daily gains to the end of 150 days were 2.21 and 1.88 lbs., and to the end of 225 days 2.13 and 2 lbs. per head in the respective lots. Up to 150 days the cost of gains in lot 1 was only slightly less than in lot 2, and, while the former lot had consumed 37.5 bu. of corn and the latter lot 22.75 bu. per head, the increased selling price per hundredweight resulted in an $8.23 greater margin for lot 1. By the end of 225 days lot 1 had consumed about 60 bu. of corn and lot 2 45.5 bu. While the cost of gains was slightly higher in lot 1, the increased selling price per hundredweight still left a margin of $4.47 in favor of lot 1 over lot 2. These results indicate the value of full feeding of grain rather than limiting the amount fed during the fattening period, and also the possibility of carrying good quality yearlings on a long feed.

III. *Wintering well; grazing without grain to July 31; full feeding 100 days in a dry lot.*—The results reported in this section have been previously noted (E. S. R., 61, p. 158).

IV. *Wintering and grazing steer calves.*—The results reported in this section have been previously noted (E. S. R., 61, p. 158).

Cattle feeding investigations, 1928–29, B. M. Anderson, C. W. McCampbell, and M. A. Alexander (*Kansas Sta. Circ. 152 (1929), pp. 13, fig. 1*).—Continuing the studies above noted, the results reported are divided into 3 parts, parts 1 and 2 being by Anderson and Alexander.

I. *The relative value of cottonseed meal, linseed oil meal, and corn gluten meal, fed separately and in combination, as protein supplements in cattle fattening rations.*—In this study calves averaging 388 lbs. per head were divided into 7 lots of 8, 10, 7, 10, 9, 10, and 9 head, respectively. A basal ration of shelled corn, corn silage, and alfalfa hay was fed in each lot for a period of 180 days. In addition the respective lots received the following protein supplements. Cottonseed meal; linseed oil meal; corn gluten meal; cottonseed meal and linseed oil meal 1 : 1; cottonseed meal and corn gluten meal 1 : 1; linseed oil meal and corn gluten meal 1 : 1; and cottonseed meal, linseed oil meal, and corn gluten meal 1 : 1 : 1. The average daily gains were 2.08, 2.22, 2.11, 2.23, 2.07, 2.26, and 2.18 lbs. per head, respectively.

On the basis of cost per 100 lbs. of gain and necessary selling price to break even, the supplement fed in the first three lots ranked in the order of corn gluten meal, linseed oil meal, and cottonseed meal, but on the basis of ultimate margin per steer the order was linseed oil meal, corn guten meal, and cottonseed meal. On the basis of average daily gain, cost of 100 lbs. of gain, necessary selling price to break even, appraised value per hundredweight, and margin per steer, the supplements fed in the last four lots ranked as follows: Linseed oil meal and corn gluten meal 1 : 1. On the basis of return per steer the supple-linseed oil meal, cottonseed meal, and corn gluten meal 1 : 1 : 1, and cottonseed meal and corn gluten meal 1 : 1. On the basis of return per steer the supplements ranked in the following order by lots: Lots 6, 4, 2, 7, 3, 1, and 5.

II. *Corn, cottonseed meal, corn silage, and alfalfa hay v. corn, cottonseed meal, corn silage, and ground limestone.*—Lots of 8 and 10 steer calves each, averaging approximately 387 lbs. per head, were fed for 180 days. Lot 1 was fed shelled corn, cottonseed meal, alfalfa hay, and corn silage, while lot 2 received corn, cottonseed meal, silage, and finely ground limestone. The average daily gains were 2.08 and 2.07 lbs. per head in the respective lots. The feed cost per 100 lbs. of gain was somewhat cheaper in lot 2, but the finish attained in this lot was not quite equal to that of lot 1, and the selling price per hundredweight was slightly less. The margin per hundredweight was 10 cts. higher in lot 1 than in lot 2.

III. *Wintering well, grazing without grain to approximately August 1, then full feeding 100 days in a dry lot.*—This study was carried on with 2 lots of 10 steer calves, each averaging 345 lbs. per head at the beginning of the study. Lot 1 was fed 5 lbs. of shelled corn, 1 lb. of cottonseed meal, 2 lbs. of alfalfa hay, and all the cane silage they would consume during a 137-day wintering period, while lot 2 received the same rations except that no corn was fed. The average daily gains were 2.08 and 1.4 lbs. per head in the respective lots. The appraised value of the steers at the end of this phase of the study was $12.00 and $12.50 per hundredweight in the respective lots.

From May 1 to July 30 both lots were grazed on bluestem grass, and on this the average daily gains were 0.89 and 1.32 lbs. per head in the respective lots. At the end of this phase of the study the necessary selling price to break even was $9.59 and $9.11 per hundredweight in the respective lots.

Both lots were fed ground corn, cottonseed meal, and alfalfa hay in dry lot from July 30 to November 6. During this period the average daily gains were 2.86 and 2.76 lbs. per head in the respective lots. There was practically no difference in the feed cost per 100 lbs. of gain during this phase of the study. Although lot 1 cost more at the end of the study, the increased finish permitted the steers to sell for 50 cts. more per hundredweight than those of lot 2 and to return a margin of about $6 more per steer than lot 2. The dressing percentage was practically the same in both lots.

Retarded growth and mature size of beef steers, A. G. Hogan (*Missouri Sta. Research Bul. 123 (1929), pp. 52, pls. 4, figs. 16*).—Concluding this study begun in 1914 and ended in 1926 (E. S. R., 54, p. 759), it was found that the length of the period of growth of normal beef steers was about 6 years. In one case a low plane of nutrition lengthened this period to 9 years. Severe undernutrition during the first 3 years or longer tended to reduce the mature size, although there were exceptions. The severity and length of underfeeding affected the mature size attained. All cattle did not make the same percentage gains in all measurements. Retarding growth did not result in abnormalities in form.

Appended are tables giving detailed records of the study.

A study of the grades of feeder steers while on feed and after slaughter (*Texas Sta. Rpt. 1929, pp. 37, 38*).—In a study by J. H. Knox of the effect of the grade of feeder cattle on the rate and economy of gain, the dressing percentage, and the grade of carcass produced, it was found that 10 choice feeders made an average gain during a 150-day feeding period of 362.5 lbs. per head at a feed cost of $43.42 per head. Good feeders gained 347.7 lbs. at a cost of $43.16 per head, medium feeders gained 379.2 lbs. at a cost of $45.92 per head, and common feeders gained 341.2 lbs. at a cost of $38.33 per head. The initial cost and the selling price per hundredweight were $12.75 and $13 for choice feeders, $11 and $12.50 for good feeders, $10.50 and $12 for medium feeders, and $8.75 and $11.25 for common feeders.

Linseed oil meal vs. cottonseed meal for growing beef calves, 1930, O. S. Willham ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 17 (1930), pp. 12–15*).—Continuing this study (E. S. R., 61, p. 559), 2 lots of 5 calves each averaging 434 lbs. per head were fed for 90 days on a ration of ground barley and ground milo, equal parts, carbonaceous roughage, and either linseed meal or cottonseed meal. The calves receiving cottonseed meal made an average daily gain of 1.71 lbs. per head, while those receiving linseed meal gained 1.61 lbs. The feed cost per 100 lbs. of gain was nearly $2 more in the linseed meal lot than in the cottonseed meal lot. Aside from the cost of gain, there was little difference in the groups of calves fed the two supplements.

The feeding value of meadow hay cut at different dates, C. B. Jones (*Welsh Jour. Agr., 4 (1928), pp. 75–92*).—Based on 4 years' results with sheep, it was found that there was little difference in the feeding value of meadow hay cut in June or July. On the other hand, hay cut in August was quite inferior in feeding value. The first two cuttings had a definite production value, while the August hay was barely good enough for maintenance.

The results indicate that the stage of maturity at the time of cutting, which varies according to season, determines the value of hay. The study also brings out the fact that allowing the hay to remain standing in order to secure greater bulk is poor practice since the hay deteriorates in chemical composition as it matures.

Comparison of pastures by means of sheep, M. G. Jones (*Welsh Jour. Agr., 4 (1928), pp. 183–206, figs. 5*).—This study at the Welsh Plant Breeding Station, Aberystwyth, Wales, was designed to ascertain the effect of the stand of grass on the grazing animal and also the effect of the grazing animal on the stand of grass. A temporary and a permanent pasture were used in this work. Mature ewes were placed on each kind of pasture for 3 days, and the difference between the grass left after grazing on the pasture plats and that on the control plats was taken as representing what the animals consumed. To determine the characteristic behavior of the sheep, together with the maintenance and live weight increment of the animals on the two pastures and also the effect on such increment of the addition of nitrogenous fertilizers, lambs were grazed for periods of 10 weeks.

A mature sheep was found to consume from 10 to 20 lbs. of green grass per day, equivalent to from 2 to 4 lbs. of air-dry grass. Under ordinary conditions a sheep consumes a greater proportion of leaf to stem on temporary than on permanent pasture and, therefore, eats a more nutritive ration. The live weight increment was greater on temporary than on permanent pasture, and, while the application of nitrogen improved both pastures in this respect, the temporary pasture showed the greater benefit. The live weight increment decreased as the pasture season advanced, but fertilizing aided in delaying this deterioration. Overstocking was more harmful to the temporary than to the permanent pasture. The more time the animals spent in resting and the less time in grazing, and particularly in chewing the cud, were observed to be indications of good pasture. The time of the year and the intensity of the grazing were the most important factors in determining the composition of the pasture. The effect of the system of management of one year on the composition of the sod the following year was determined by the intensity of grazing in relation to the season of the year.

Rate of growth in lambs, R. Phillips (*Welsh Jour. Agr., 4 (1928), pp. 121–141*).—A preliminary study of the rate of growth of lambs was made at University College, Aberystwyth, Wales, basing the results on two flocks of sheep fed solely on grass except for short periods during the spring when mangolds were fed in limited amounts.

It was found that the birth weight of a lamb was no criterion of the rate of growth. Such factors as sex, individuality, age, and whether a twin or single lamb did, however, influence the rate of growth. In the flocks studied the average rate of increase in weight per lamb per day was from 8 to 10 oz. for the first 4 months, after which the rate of growth decreased rapidly. Lambs dropped in February and March approached their maximum weight in August, but were most valuable from the butcher's standpoint in May and June. The lambs dropped by yearling ewes were usually about 10 days younger than the others, but grew as rapidly. From this it is concluded that the practice of breeding ewe lambs under favorable conditions is sound.

Lamb-raising trials, 1928, J. M. Coleman (*Agr. Gaz. N. S. Wales, 40 (1929), No. 7, pp. 517–519*).—Rams of the Dorset Horn, Ryeland, and Border Leicester breeds were mated to lots of 59 Merino ewes each at the Bathurst Experiment Farm, New South Wales. In the respective lots an 86.4, 66, and 62.7 per cent lamb crop was raised. In the lot bred to the Ryeland rams, 11 ewes needed assistance at lambing, and 4 ewes and 14 lambs died as a result of lambing. These losses were believed due to the exceptional width across the poll of the Ryelands. The carcasses of the lambs of this cross were very uneven and of poor quality. The Dorset Horn cross produced the best dressing carcasses and made a higher average return per ewe than the Border Leicester cross, which, in turn, was better in this respect than the Ryeland cross.

At the Cowra Experiment Farm, Lincoln-Merino and Border Leicester-Merino crossbred ewes were bred to Ryeland and Dorset Horn rams. A 97.5 per cent lamb crop was raised in the Dorset Horn group and a 98 per cent crop in the Ryeland group. In the latter lot 24 per cent of the ewes produced twin lambs. The lambs produced in the Dorset Horn lot sold for a higher average price per head, and the average return per ewe was greater than in the Ryeland group.

[Experiments with sheep and goats at the Texas Station] (*Texas Station Rpt. 1929, pp. 30, 31, 36, 37, 39, 40*).—The results of experiments in continuation of those previously noted (E. S. R., 62, p. 658) are reported.

Relation of skin folds to weight of fleece on Rambouillet sheep.—During the year a slightly greater yield in weight of clean fleece was obtained from the B type than from the C type Rambouillets, but the reverse was true in length of staple. The average shrinkage during scouring was 57.6 per cent for C type fleeces and 61.7 per cent for B type fleeces. Over a period of 10 years it was found that Rambouillet ewes produced their heaviest fleeces at from 2 to 5 years of age.

Methods of preparing sorghum roughages and grains for feeding to fattening calves and lambs.—In a study of ground roughages lambs gained as follows: On alfalfa 0.364 lb. per head per day, ground redtop fodder 0.299 lb., ground feterita fodder 0.283 lb., ground kafir fodder 0.28 lb., ground hegari fodder 0.3 lb., ground milo fodder 0.303 lb., ground milo fodder with limestone flour 0.337 lb., ground redtop fodder without limestone 0.338 lb., and ground redtop fodder with limestone 0.36 lb. The lots receiving ground limestone supplementing sorghum roughage attained the same finish as those fed on alfalfa and, with one exception, sold for from 50 to 75 cts. more per 100 lbs. than lots finished on the grain sorghums without this supplement. A comparison of ground and whole threshed milo showed no advantage for grinding. When cottonseed cake screenings were fed as a supplement to a ration of milo and alfalfa hay, the gains were increased and a better finish was attained. Thrifty lightweight lambs made as economical gains as did heavier lambs.

A study of the adaptation of the Corriedale sheep to southwestern Texas range conditions.—Rambouillet ewes under range conditions were more thrifty, weighed from 15 to 20 lbs. more at maturity, and produced a slightly heavier fleece than did Corriedale ewes. In the spring of 1929, 190 Rambouillet ewes had a 101.6 per cent lamb crop as compared with an 81.2 per cent lamb crop for 32 Corriedale ewes.

An economic study of shearing once v. twice a year.—This study has been in progress for 9 years, and the data are based on 1,400 individual shearings of Rambouillet sheep sheared once a year and about the same number sheared at 6-months intervals. The average difference in grease wool per head per year was 0.77 lb. in favor of the groups sheared at 6-months intervals. An average of 0.83 lb. more wool per head yearly was produced by 925 head of aged ewes sheared twice a year than by 885 similar ewes sheared once a year. The 327 yearling ewes sheared twice a year produced an average of 0.75 lb. more wool per head than 314 ewes sheared once a year. The lamb crop of 914 aged ewes sheared once was 93 per cent and of 928 ewes sheared twice 91 per cent. The lamb crop of 323 yearling ewes sheared once and 327 ewes sheared twice was 63 and 66 per cent, respectively. In the aged ewes there was a death loss of 2.8 per cent in those sheared once and 1.7 per cent in those sheared twice, while the death loss of the yearling class was 3.1 per cent in those sheared once and 1.2 per cent in those sheared twice.

Methods of feeding and the feeding value of grain sorghums for swine (*Texas Sta. Rpt. 1929, pp. 83, 84*).—In this study two tests of 90 days each were conducted using lots of 10 pigs each averaging 50 lbs. per head in the first test and lots of 8 pigs each averaging 65 lbs. per head in the second test. The rations were all self-fed free choice, and all lots had access to tankage.

When pigs were fed on concrete floors so that no grain was wasted, no increase in gains was noted on ground milo as compared with whole milo, and grinding saved only 5 lbs. of grain and 1 lb. of tankage per 100 lbs. of gain. With kafir the ground grain produced 0.07 lb. faster gains per day and required 14 lbs. less grain and 4 lbs. less tankage per 100 lbs. of gain than whole grain. Pigs receiving dry milo heads gained as rapidly as those receiving soaked heads. Soaking saved about 0.6 lb. of milo per head per day, but this saving did not pay for the labor involved. Pigs made the same gain per day on soaked as on dry whole milo, but those on the soaked grain required 20.5 lbs. more milo and 3.28 lbs. more tankage per 100 lbs. of gain than those on dry milo. On threshed milo pigs made an average daily gain of 1.71 lbs. per head as compared with 1.54 lbs. per head for pigs on dry milo heads, and the former pigs required 33.88 lbs. less grain and 6.71 lbs. less tankage per 100 lbs. of gain.

Ferric citrate as an ingredient of mineral mixtures in paired-feeding experiments with growing swine, W. E. CARROLL, H. H. MITCHELL, and G. E. HUNT (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 10, pp. 921–926*).—Concluding this study (E. S. R., 62, p. 365) at the Illinois Experiment Station, the blood of seven pairs of pigs was examined at the end of the feeding period. The blood of the pigs that received iron showed a consistently higher red cell count and a higher iron content. This difference was statistically significant, but the practical significance was unimportant since the pigs receiving no iron were not anemic, and there was no reason to believe that the iron supplement had any beneficial effect upon the pigs receiving it.

The production and cure of nutritional anemia in suckling pigs, T. S. HAMILTON, G. E. HUNT, H. H. MITCHELL, and W. E. CARROLL (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 10, pp. 927–938, figs. 3*).—This is a more detailed account of work previously noted (E. S. R., 62, p. 365) from the Illinois Experiment Station.

Value of cottonseed meal as a feed for work horses and mules (*Texas Sta. Rpt. 1929, p. 37*).—Continuing this study (E. S. R., 62, p. 660), no specific injurious effects have been noted on the general health or fertility of young stock on limited amounts of cottonseed meal over a period of one year and in some cases two years. Although a few animals have not shown a particular liking for the meal, none has refused to eat it.

[Experiments with poultry at the New Mexico Station] (*New Mexico Sta. Rpt. 1929, pp. 70–72*).—The results of experiments in continuation of those previously noted (E. S. R., 61, p. 261) are reported.

Poultry breeding.—By the use of pedigreed males the average annual egg production of the flock was increased from 128.1 in 1924 to 171 in 1928 with the peak of 176.5 reached in 1927. The number of individuals producing 200 or more eggs was increased from 3 to 32 per cent during this period.

Poultry management and cost of production.—In this test 4 pens of 20 White Leghorns each were fed the same basal mash and scratch mixtures, except that lot 2 had alfalfa leaf meal and lot 3 alfalfa meal added to the mash. Lot 1 was maintained on green alfalfa range the year round, while the other lots were in bare yards. Lot 4 received cut green alfalfa fed in amounts equal to that consumed in lots 2 and 3. The total egg production from December 1 to June 30 was 1,858, 1,950, 1,918, and 2,052 in the respective lots.

Cottonseed meal feeding experiment.—The average egg production over a 3-year period was 3,727 in a lot on alfalfa range and receiving 23 per cent of tankage, 3,471 for a lot on alfalfa range receiving 20 per cent of tankage and 5 per cent of cottonseed meal, 3,613 on alfalfa range and 15 per cent each of tankage and cottonseed meal, 3,217 on alfalfa range and 38 per cent of cottonseed meal, 2,980 in dry lot with 23 per cent of tankage, 2,895 in dry lot with 20 per cent of tankage and 5 per cent of cottonseed meal, 2,968 in dry lot with 15 per cent each of tankage and cottonseed meal, and 2,525 in dry lot with 38 per cent of cottonseed meal.

[Experiments with poultry at the Texas Station] (*Texas Sta. Rpt. 1929, pp. 88, 89*).—The results of three experiments are noted.

Sources of protein for laying hens.—Continuing the study of the effect of cottonseed meal on the storage qualities of eggs (E. S. R., 58, p. 869), it was found that as little as 2 gm. of cottonseed meal fed daily caused eggs to deteriorate in storage.

The varied yolk colors observed were mottled yellow, salmon, green, and almost black. It was also observed that during storage some of the yolks absorbed part of the white. The whites were found to vary in color from normal to pink.

Some grains compared.—In this study the grains compared made up 20 per cent of the mash by weight, and the same grain in each case formed the exclusive scratch grain. Two lots of birds were fed each grain. In both cases the most eggs with the least feed per dozen eggs were produced in the lots receiving yellow corn feed meal, followed in descending order by white corn feed meal, ground kafir, and ground milo.

Comparison of various feeds for young chickens.—Meat scrap was fed in rations to baby chicks to the extent of 5, 7.5, 10, 12.5, and 15 per cent, while cottonseed meal formed 7.5, 11.25, 15, 18.75, and 22.5 per cent of other rations. The results based on mortality and gain in weight indicated that a medium amount of either meat scrap or cottonseed meal gave the best results.

In a second test, meat scrap formed 9, 10, and 11 per cent, cottonseed meal 11.75, 13, and 14.25 per cent, and dried skim milk 15.25, 17, and 18.75 per cent of the rations for growing chicks. The medium amount of dried skim milk and the larger amounts of meat scrap and cottonseed meal produced the best results. Chicks on a medium amount of dried skim milk made a pound of gain on 3.7 lbs. of feed, while those on large amounts of cottonseed meal and meat scrap required 4.3 and 4.5 lbs. of feed, respectively, to produce a pound of gain.

Cycles in the prenatal growth of the domestic fowl, A. L. Romanoff (*Science, 70 (1929), No. 1820, p. 484, fig. 1*).—In this study the author has found that the fluctuations in the growth of the chick embryo are caused by normal chemical and physiological changes in the course of prenatal development. Three well-defined cycles in the growth of the embryo were found, a period of progressive growth, followed by a period of retardation in growth, which usually falls at about the ninth to the sixteenth day of incubation, and a final period of growth.

These cycles of growth were regular only when the temperature and humidity of the incubator were accurately controlled. Temperatures higher than usual caused the cycles to appear earlier, while lower temperatures had the opposite effect. Extreme abnormalities during incubation prevented the cycles from being distinctly outlined.

Sex differences in the normal growth rate of chicks, C. W. Ackerson and F. E. Mussehl (*Jour. Agr. Research [U. S.], 40 (1930), No. 9, pp. 863–866*).—The data obtained from individual weighings of 397 male and 403 female White Leghorn chicks at 1, 3, 5, 7, and 9 weeks of age were statistically analyzed at the Nebraska Experiment Station to determine differences due to sex in growth rate of chicks. The differences in the mean weight of male and female chicks were significant at 1 week of age, and the significance increased thereafter.

The authors suggest a factor for use in bringing lots with different numbers of male and female chicks to a common basis for purposes of comparison in studies with chicks.

Poultry sanitation (*U. S. Egg and Poultry Mag., 35 (1929), No. 10, Sect. 2, pp. 16, figs. 25*).—This publication describes and illustrates the value of proper sanitation as a fundamental practice in the successful raising of chicks.

Feed consumption and costs in raising turkeys, E. M. Funk and P. H. Margolf (*Pennsylvania Sta. Bul. 250 (1930), pp. 11, figs. 3*).—To obtain information on growth, feed consumption, feed costs, and mortality of turkeys, 134 poults of the Bronze and White Holland varieties were fed for 24 weeks. The poults were hatched in an incubator operated in practically the same manner as in hatching chicks, and were brooded in a long continuous house. Until 20 weeks of age they were fed by the all-mash method on a ration composed of yellow corn meal, wheat bran, wheat flour middlings, alfalfa leaf meal, dried buttermilk, fish meal, meat scrap, steamed bone meal, salt, and cod-liver oil. Water and liquid buttermilk were before the poults at all times until the nineteenth week, when condensed buttermilk was substituted for the liquid. At 8 weeks of age ground oats were added to the mash, and at the seventeenth week 5 lbs. of corn meal was substituted for a like amount of dried buttermilk. At 20 weeks equal parts of corn and wheat were fed in the mash hoppers. Green feed was before the birds at all times. The poults were confined until 18 weeks of age, when they were turned on range to minimize feather picking. Each poult was wing banded and weighed individually every 2 weeks to 16 weeks of age and then every 4 weeks. At the end of the test the live weight, blood and feather weight, and full-drawn weight of each turkey were determined.

A growth faster than any previously reported by the station was obtained in this study. The mash and grain consumption per bird for 24 weeks was 58.05 and 56.12 lbs. for the Bronze and White Holland varieties, respectively, and the cost per pound of gain 14.7 and 15.3 cts., respectively. The feed required to produce a pound of gain increased from 2.56 to 7.71 lbs. as the poults matured. A protein level of about 20 per cent was maintained until the eighteenth week, and then decreased to 14.8 per cent at 24 weeks. The mortality rate was less than 7 per cent. Under the confinement system excellent market birds were produced.

The blood and feather dressing loss for males was 9.5 per cent and for females 10.4 per cent, and the total shrinkage based on full-drawn weight was 24.2 per cent for males and 24.7 per cent for females. The differences were due to size and not to sex.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Texas Station] (*Texas Sta. Rpt. 1929, pp. 85–87*).—The results of experiments in continuation of those previously noted are reported (E. S. R., 62, p. 663).

Feeding value of cottonseed hulls as a roughage for growing dairy heifers.—The average score of 24 heifers fed cane hay was 80.67 ± 1.01 per cent in November and for 17 head of the same heifers 76.41 ± 1.45 per cent in June. The corresponding scores for heifers fed cottonseed hulls were 77.00 ± 1.12 per cent (22 head) and 72.24 ± 1.91 per cent (17 head).

The use of cottonseed meal and hulls as a ration for lactating cows.—No material differences in the general health and condition of the udders of the cows in this test were observed that could be attributed to differences in the rations. Observations on fertility and reproduction did not show that the feeding of cottonseed meal, even in excess, had any significant effects as compared with a balanced ration. Cottonseed meal had no apparent constipating effect as judged by the consistency of the feces.

The butter made from cows on a heavy ration of cottonseed meal scored 1 point higher for texture and 1 point lower for keeping quality after 2.5 months' storage than the butter from cows on a balanced ration. The melting point was slightly higher for the butter from cows on the heavy feed of cottonseed meal, but there was no difference in Reichert-Meissl number of the two butters.

The effect of a cottonseed meal and alfalfa ration on the growth, vigor, breeding, and lactation of dairy heifers (*New Mexico Sta. Rpt. 1929, pp. 43, 44*).—Twenty grade Holstein heifers were divided into four lots of five head each. All lots received mixed corn, and in addition the following feeds were given: Lot 1, linseed oil meal, wheat bran, corn silage, and alfalfa hay; lot 2, cottonseed meal, corn silage, and alfalfa hay; lot 3, cottonseed meal, corn silage, and cane hay; and lot 4, cottonseed meal and cane hay. One heifer in lot 2 died after showing typical symptoms of cottonseed meal injury. All the heifers showed signs of depraved appetites by chewing boards in the fences and mangers. Considerable difficulty was experienced in getting the older heifers bred regardless of the ration fed.

Calf feeding investigations.—I, Raising dairy calves on nurse cow, whole milk, remade skim milk, and calf meal, L. W. INGHAM, DEV. MEADE, and M. H. BERRY (*Maryland Sta. Bul. 319 (1930), pp. 277–302, figs. 7*).—To determine whether or not it was possible to raise strong, healthy, vigorous calves by feeding substitutes for or supplements to whole milk and to compare the relative cost and efficiency of several methods of feeding, 16 calves ranging in weight from 70 to 115 lbs. and in age from 8 to 20 days were fed from October 15 to April 15. The animals were divided into 4 lots of 4 head each. Lot 1, composed of the 4 youngest and smallest calves, were all put on one nurse cow; lot 2 was hand-fed a minimum amount of whole milk; lot 3 hand-fed remade skim milk (1 part of skim milk powder to 9 parts of water); and lot 4, Maryland Calf Meal mixture (equal parts of ground yellow corn, ground oats, wheat bran, skim milk powder, and one-half part of linseed meal). The latter mixture was fed as a gruel, 1 part being mixed with 9 parts of water, to which was added 1 per cent of salt.

The calves in lot 1 were allowed to nurse the cow twice a day until December 3, once a day to December 14, and then weaned and put on grain and hay. It was estimated that each calf received about 8 lbs. of 4 per cent milk daily while nursing the cow and in addition received 32.35 lbs. of dry skim milk powder during the test. These calves made an average daily gain of 1.42 lbs. per head at a cost of 11 cts. per pound of gain. These calves were in normal health, showed no signs of scouring, and had sleek coats and a pleasing appearance throughout the test.

In lot 2 the calves received 10 lbs. of whole milk per head daily to December 3, from then to December 17 the amount was gradually reduced, and on the latter date the calves were weaned and placed on grain and hay. The animals received 31.64 lbs. of dry skim milk powder during the test. They made an average daily gain of 1.24 lbs. per head at a cost of 15 cts. per pound of gain. One calf in this lot died, but not apparently from any effect of feeding. All the calves showed a tendency to scour while receiving whole milk and, as a whole, were the poorest from the standpoint of health, thrift, condition, and general appearance in the test.

At the start of the experiment the calves in lot 3 were receiving 5 lbs. of whole milk daily, for which was substituted 1 lb. of remade milk for 1 lb. of whole milk every other day. The 5 lbs. of remade milk was fed to December 3, gradually decreased to December 17, and the animals then placed on grain and hay. The group made an average daily gain of 1.45 lbs. per head at a cost of 8 cts. per pound of gain. A tendency to scour was noted during the change from whole to remade milk. This method of feeding, however, was convenient, saved time and labor, and was quite efficient after the animals had a good start.

One pound of calf meal mixture gruel was substituted for 1 lb. of whole milk every other day at the beginning of the test in lot 4. When from 8 to 9 lbs. of gruel was reached the calves refused to drink it, but would eat the mixture dry. These calves made an average daily gain of 1.36 lbs. per head at a cost of 8 cts. per pound of gain. While this lot was rough and did not carry the flesh or condition of some of the other groups during the early part of the test, this group finished in as good condition as any of the lots. This method of feeding was somewhat cheaper than the other methods and reduced the whole milk, grain, and skim milk to a minimum.

These results indicate that large, vigorous calves may be dropped from liquid feeding when from 30 to 45 days of age, while less vigorous calves should be continued to 60 days of age. The nurse cow is very satisfactory for raising delicate and valuable calves, but hand-feeding of whole milk is too costly a method. Approximately 100 lbs. of whole milk and from 60 to 85 lbs. of dry skim milk, part of which may be fed as a liquid, are required to raise a normal calf.

Milk goat improvement (*New Mexico Sta. Rpt. 1929, pp. 44–46*).—Continuing this study with goats (E. S. R., 61, p. 263), it was found that when Yapp's formula for determining the productive ability of a sire (E. S. R., 62, p. 370) was applied to the offspring of a buck bred to his own daughters there was a decrease in milk production. The percentage loss for one buck in this study was 48.4 per cent and for another 37.6 per cent.

The relation of food to the composition of milk, R. O. Davies and A. L. Provan (*Welsh Jour. Agr., 4 (1928), pp. 114–121*).—The milk of 14 cows at University College, Aberystwyth, Wales, was analyzed just before the animals were turned on pasture in the spring and again 2 weeks later. The analyses showed that after this period of grazing there was usually an increase in the total protein, casein, total phosphorus, inorganic phosphorus, and calcium content of the milk. These changes in composition were found to depend on the manner in which the cows were fed during the winter months. The results suggested that the amount of available phosphorus in the home-grown feeds of mid Wales might be a limiting factor in milk production.

Studies on colostrum, A. L. Provan (*Welsh Jour. Agr., 4 (1928), pp. 141–147, fig. 1*).—In an effort to determine the influence of age and breed on composition. samples of colostrum from Shorthorn, Welsh Black, Ayrshire, and Jersey cows were analyzed at University College, Aberystwyth, Wales.

The analyses showed that the composition varied widely, the constituents subject to the widest variations being fat and protein. Colostrum was much richer than ordinary milk, particularly in protein, while the ash content was also high, being much richer in phosphoric acid than regular milk. The excess of protein and chloride disappeared rapidly during the first few milkings, while the amount of lime and phosphoric acid remained high for some time. The fat content of colostrum decreased with the age of the cow, and the percentages of solids-not-fat and protein, while high after the first calving, decreased to a lower level after the second and third calf, and then increased to a constant level for later calves. The percentages of ash and phosphoric acid reached a maximum after the fourth or fifth calf, while the lime content rose with successive calves. A comparison of the colostrum of the breeds studied showed that of the Welsh Black to be poorer in solids-not-fat and protein than the colostrum of the other breeds, while that of the Jersey was exceptionally rich in lime and phosphoric acid.

The normal limits of variation of the methylene-blue reduction test, A. C. Fay (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 9, pp. 855–862*).—The expected limits of normal variation of the methylene-blue test were studied at the Kansas Experiment Station to obtain more concrete evidence of its accuracy and reliability. An effort was also made to determine the effect of modifications of technic that have been adopted as a means of simplifying the test.

The maximum and minimum reduction time of from 75 to 100 tests made on each of 19 samples of milk were relatively close together. On the usual basis of classification, 8 of the 19 samples would have been in class 1 (reduction time more than 330 minutes), 5 in class 2 (reduction time between 120 and 330 minutes), and 6 in class 3 (reduction time between 20 and 120 minutes). The values for 3.2 times the probable error for the class 3 samples ranged from ±2 to ±17 minutes, and for class 2 and 1 samples ±30 minutes. Of the class 1 samples requiring 7 and 8 hours for reduction, the limits of certainty of the test were 45 and 70 minutes, respectively.

The various modifications tested for measuring samples, such as the use of a 10-cc. pipette, a 10-cc. standard cup, or a graduated test tube, the use of glassware that had been only partially sterilized, and the use of methylene blue prepared from a tablet or from powdered dye, did not seriously impair the accuracy of the test. When varying amounts of dye solution were added the reduction time was directly related to the amount of dye added. This relationship of reduction time and amount of dye solution indicated that gross errors in measuring introduced variations that impaired the accuracy of the test.

When the data were treated statistically, it was found that the limits of normal variation in reducing time were so close together that even errors of a relatively few minutes were well outside the expected limits of error. While errors of from 10 to 15 minutes were statistically significant for routine analysis, they were within the demands for accuracy. The modifications of technic tested enlarged the field of adaptability of this test without seriously affecting its interpretative value.

Factors influencing properties of fermented reconstructed milk, W. H. E. Reid and F. F. Welch (*Missouri Sta. Research Bul. 135* (*1930*), *pp. 14*).—This is a study of a number of factors that might influence the quality of fermented milk made from reconstructed skim milk. The reconstructed skim milk was made by adding 9 lbs. of water to 1 lb. of skim milk powder. This milk was then pasteurized at 82.22° C. (180° F.) for 30 minutes, cooled to 22.22°, transferred to sterile quart bottles, and inoculated. The inoculated milk was incubated at 22.22° for from 12 to 14 hours and then stored at 5.55° for 8 hours. The curd was broken by gently agitating the bottles, and three samples were removed and placed in sterile bottles for testing and scoring after 24, 72, and 124 hours' storage at 5.55°. The remainder of each lot was scored and tested immediately.

A product of very desirable quality characterized by a consistently smooth body and texture was made from reconstructed skim milk when the processes pertinent to its manufacture were recognized and carefully controlled. Modifications of the manufacturing process either improved or impaired the quality of the product.

From the standpoint of aroma, flavor, texture, and acidity, the use of 10 per cent of a high quality starter gave better results than the use of 2, 4, 6, or 8 per cent. Cooling subsequent to pasteurization had no effect on the quality of the fermented milk, but pasteurizing at high temperatures or for long periods should be avoided. The addition of 0.35 per cent of gelatin improved the body and texture of the fermented milk, and the addition of normal skim milk in amounts exceeding 10 per cent increased the desirability of the product. The cooling of fermented milk prior to breaking the curd increased the scores of aroma, flavor, body, and texture. No deterioration in quality of product was noted when the fermented milk was stored for 5 days at 3.89°, while a decrease in quality occurred after 3 days' storage at 5.55°, and an inferior product resulted from storage for 24 hours at 15.55°.

Producing quality cream, W. H. Martin and W. J. Caulfield (*Kansas Sta. Circ. 154* (*1929*), *pp. 18, figs. 7*).—The essentials necessary for producing cream of high quality are discussed in this publication. Special attention is directed to chemical sterilization of equipment and to cooling.

The effect of different homogenization processes on the physical properties of an ice cream mixture and the resulting ice cream when the percentage of fat is varied and the solids not fat remain constant, W. H. E. Reid and L. B. Russell (*Missouri Sta. Research Bul. 134* (*1930*), *pp. 40, figs. 24*).—Concluding this study (E. S. R., 60, p. 368), it was found that homogenization disintegrates the fat globules of an ice cream mix and increases the surface area of the fat. Increasing amounts of butterfat reduced the amount of free serum and resulted in an increase in viscosity and surface tension. After homogenization, ice cream mixes were more receptive to the incorporation of air. By regulating the temperature within the freezer, the time required to freeze a mix and the percentage of overrun were controlled in part. Homgenization, however, reduced the stability of ice cream at summer temperatures. When drawn at proper consistency the length of time of freezing did not influence the quality of the resulting ice cream. When the solids-not-fat remained constant and the butterfat content increased, the pressure as judged by the production of best quality ice cream decreased, but a simultaneous increase in pressure and decrease in fat did not produce an ice cream of the quality of a mix containing a higher percentage of fat. Quality improved as the percentage of fat increased within the range of from 10 to 16 per cent.

The influence of the use of butter on the freezing properties of ice cream mix, R. Whitaker (*Jour. Dairy Sci., 13* (*1930*), *No. 1, pp. 1–7, figs. 2*).—A quantity of fresh 40 per cent cream was held for several hours at from 45 to 50° F. at the New York Cornell Experiment Station, and then half of it was churned and worked into butter. The remainder of the cream and the butter were used in preparing separate ice cream mixes containing 10 per cent of fat, 10 per cent of milk solids-not-fat, 14.5 per cent of sugar, and 0.5 per cent of gelatin. Dry skim milk was used to supply the solids-not-fat which were not furnished by the cream. The mixes were pasteurized, homogenized at 3,000 lbs. pressure, cooled, aged for 24 hours at 35°, and frozen separately.

The mixes containing butter did not develop as much swell and required nearly twice as much time to reach a 90 per cent overrun as mixes containing cream. Other workers have found that the lecithin content of cream and buttermilk is considerably higher than that of skim milk and butter, and since the mixes made with butter did not contain the cream serum or "buttermilk solids" the results indicate that lecithin may be responsible for the differences in freezing properties.

The dairy surplus, W. E. Connell (*[Oklahoma] Panhandle Sta., Panhandle Bul. 17 (1930), pp. 15–18*).—In this article the author reviews the butter situation of the United States, especially as it applies to Oklahoma, and tells of the steps that have been taken to reestablish the consumption of butter and other dairy products.

VETERINARY MEDICINE

Livestock and poultry diseases, W. A. Billings (*New York: Macmillan Co., 1930, pp. XVI+[1]+504, figs. 56*).—Following an introductory chapter on how sanitation may prevent livestock diseases (pp. 1–10), the successive parts deal with the diseases of cattle (pp. 11–165), horses (pp. 166–233), sheep (pp. 234–320), swine (pp. 321–437), and poultry (pp. 438–495).

[Report of work with diseases and parasites of livestock by the Texas Station] (*Texas Sta. Rpt. 1929, pp. 7–13, 38, 139–141*).—Work on loin disease of cattle (E. S. R., 62, p. 665) was continued during the year. Numerous experiments have consistently shown increases in the weight of animals receiving bone meal, the average in one case for a period of 2⅓ years being 113 lbs. of increase per animal. It is considered significant that the animals receiving bone meal have also from year to year since 1925 shown a rather consistent decrease in the habit of chewing bones. The losses from loin disease at the station field laboratory up to August 31, 1929, amounted to 8 head for animals receiving bone meal or other mineral mixtures as compared to a loss of 27 head for the control animals receiving no bone meal. Some animals, however, can not be broken of the bone-chewing habit by access to bone meal, emphasizing the necessity of removing bones and carcass material from the range.

The use of iron ammonium citrate and sodium acid phosphate; potassium bicarbonate, potassium sulfate, potassium phosphate, and copper sulfate; or precipitated dicalcium phosphate fertilizer, either alone or in combination with bone meal, has had no effect on further eliminating the bone-chewing habit. The results show that while the percentage of calf crop is slightly increased, there has been a marked increase in the weight of the calves at 200 days old from cows receiving bone meal, 113 calves out of cows on bone meal weighing an average of 307.2 lbs. as compared with 284.4 lbs. for 102 calves out of control cows receiving no bone meal.

Tests of the potency of loin disease toxin have shown that when filtered to remove all organisms and kept at refrigerator temperature it has retained its toxicity for a period of 2 years and 3 months. The potency of the toxin was also tested after the culture had been allowed to become thoroughly dry through evaporation, a condition of dryness similar to that which takes place in bones on the range, and proved toxic several months later when brought back to the original moisture condition.

In continuing the study of swellhead of sheep and goats, large quantities of sacahuiste fruit, both mature and immature, fed to sheep and goats both alone and with a balanced ration, gave inconclusive results, although one lamb on an exclusive diet of the fruit developed a typical case of swellhead. Two goats fed upon *Tribulus terrestris*, which grows at the station, failed to develop symptoms of swellhead, as reported by South African workers, thus corroborating the findings of Australians.

In further work with infectious abortion, of 48 cows in a herd receiving injections of live cultures of the causative organism 32 required only one service for conception, 10 required two services, 2 required five services, 1 required six services, and 1 required seven services.

The work at the station has shown that the addition of nicotine sulfate to copper sulfate is efficient in killing not only roundworms of sheep and goats but tapeworms also. The results indicate that a smaller dosage should be used for sheep than for goats. In attempting to determine the efficiency of tetrachlorethylene as a vermifuge for stomach worms, two 2-year-old mutton goats that received a total of 14 doses each, at intervals of 1 month, of 5 cc. in soft gelatin capsules, failed to show lesions at post-mortem examination. Of 9 animals treated with 1 per cent of copper sulfate, 5 showed 100 per cent kill of the stomach worms, 1 showed 50 per cent kill, and 3 showed none killed whatever, indicating that the conditions under which it is administered determine in a definite way its effectiveness.

The administration of water containing sulfur dioxide in solution as a drench in combating stomach worms resulted in an irritation of the respiratory tract. Its use is considered impractical.

The work with sore mouth of lambs and goats gave some evidence that the affection may be communicated without an abrasion of the skin. The virus from different animals appears to vary in its potency.

Experimental dippings indicate that several of the sulfurs will completely eradicate all three species of goat lice common in the State. The fine sulfurs, the gas sulfurs, and the 200- and 300-mesh flours of sulfur, with the addition of a saponifier, have proved 100 per cent efficient at one dipping under controlled tests. However, for large-scale eradication two dippings must be recommended. Extract of Derris in dilutions from 1 to 300 up to 1 to 800 has been found to be quite promising, it mixing with water very readily and killing the lice in 4 days, with no injurious effect upon the goats.

Feeding tests with several poisonous or suspected poisonous plants are briefly reported. Coyotillo (*Karwinskia humboldtiana*) produced a partial motor paralysis in an Angora buck to which it was fed. Forced feeding of sheep and goats with bitter weed (*Actinea odorata*) strongly suggests the toxic character of this plant when consumed in large quantities because of the hemorraghic gastroenteritis found at autopsy. The dried leaves of the broadleaf milkweed (*Asclepias latifolia*) fed to one sheep and one goat resulted in their death in less than 12 hours, thus establishing its toxic nature.

Animal diseases in southern Brazil [trans. title], E. von Bassewitz (*Berlin. Tierärztl. Wchnschr., 45 (1929), No. 34, pp. 573–577; abs. in Trop. Vet. Bul., 18 (1930), No. 1, pp. 30–33*).—This is a summary of the livestock disease situation in southern Brazil.

Annual report of the Civil Veterinary Department, Bihar and Orissa, for the year 1928–29, P. B. Riley (*Bihar and Orissa Civ. Vet. Dept. Ann. Rpt. 1928–29, pp. [5]+25+XXX+5, pls. 4*).—This, the usual annual report (E. S. R., 61, p. 174), includes an account of the occurrence of and control work with the more important diseases of livestock.

Annual administration report of the Madras Civil Veterinary Department for the year 1928–29 (*Madras Civ. Vet. Dept. Ann. Admin. Rpt. 1928–29, pp. II+98+8, pls. 5*).—This, the annual report (E. S. R., 61, p. 267), includes accounts by T. J. Hurley et al. of the occurrence of and control work with the more important infectious diseases and parasites of livestock.

Hibernation of the thirteen-lined ground squirrel, Citellus tridecemlineatus (Mitchill).—IV, Influence of thyroxin, pituitrin, and desiccated thymus and thyroid on hibernation, G. E. Johnson and V. B. Hanawalt (*Amer. Nat., 64 (1930), No. 692, pp. 272–284*).—This fourth contribution from the Kansas Experiment Station (E. S. R., 62, p. 539) reports upon the use and influence on hibernation of thyroxin, pituitrin, and desiccated thymus and thyroid.

Toxicity of Bikukulla formosa (western bleedingheart), O. F. Black, W. W. Eggleston, and J. W. Kelly (*Jour. Agr. Research [U. S.], 40 (1930), No. 10, pp. 917–920, fig. 1*).—This is the report of a chemical examination and a physiological test of the extract of *B. formosa*, a fourth member of a genus which had previously been studied in the laboratory and reported on (E. S. R., 48, p. 674; 62, p. 376).

It is pointed out that a German investigator had in 1903 isolated protopine and two other crystalline alkaloids from the roots of *B. formosa*, and that protopine produces local anesthesia and, in mammals, narcosis and convulsions. An extract obtained by the authors from the dried tops of *B. formosa* from the Santiam National Forest in Oregon produced convulsions and death in mice. It is concluded that the lethal dose, calculated on the basis of percentage of alkaloids in the plant, would be represented by from 0.25 to 0.5 gm. of the dry plant. While the toxicity of the plant to mice does not prove that it is equally poisonous to other animals, it is deemed evident that *B. formosa* should be placed in the category of poisonous plants and should be regarded as a potential danger to livestock wherever it is found.

Physiology and biochemistry of bacteria, II, III, R. E. Buchanan and E. I. Fulmer (*Baltimore: Williams & Wilkins Co., 1930, vols. 2, pp. XVII+709, figs. 57; 3, pp. XV+575, figs. 2*).—This is a continuation of the work previously noted (E. S. R., 60, p. 176), in which volume 2 deals with the effects of environment upon microorganisms, and volume 3 with the effects of microorganisms upon environment—fermentative and other changes produced.

The anaplasmoses of ruminants [trans. title], **A. Donatien and F. Lestoquard** (*Rev. Vét. [Toulouse], 82 (1930), pp. 125–139, figs. 2*).—A summary of information presented under the headings of etiology, clinical study, diagnosis, and treatment.

Notes on the bacteriology of the Brucella group, K. F. Meyer and B. Eddie (*Jour. Lab. and Clin. Med., 15 (1930), No. 5, pp. 447–456*).—This account is given in connection with a list of 27 references to the literature.

Some observations on the agglutination of Br. abortus, F. B. Lynch and A. M. Callan (*Jour. Lab. and Clin. Med., 15 (1930), No. 5, pp. 444–446*).—In the attempt to prepare a safe, fairly stable, and readily agglutinable antigen of *Brucella abortus* to be used parallel with the Dreyer method for typhoid agglutination, the authors developed a method which has been continually used with practically no change. The antigen, the preparation of which is described, has given clear-cut reactions at least two months after its preparation, and tests made of ice box stored antigen over five months old have given 90 per cent clearing on the same sera.

A comparison of the agglutination and complement-fixation tests for the detection of Brucella abortus infection, A. Zeissig and H. L. Mansfield (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 2, pp. 211–220*).—The authors show that "there are three points of technic in the complement fixation test for the detection of *B. abortus* infection which, if not observed, may prove to be sources of error: (1) The antigen must be prepared free of substances in the culture medium on which it has been grown; (2) the amount of serum to be used in the test must be below the amount which interferes with the fixation of complement; and (3) cold fixation seems to be superior to rapid fixation at body temperature. The agglutination and the complement fixation tests agree very closely in the status of animals under test. Of the two, the complement fixation test, as far as laboratory processes are concerned, seems to be more clear-cut in classifying animals as reactors or nonreactors."

The relationship of human and animal brucelliasis, H. E. Hasseltine (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 3, pp. 330–339*).—This account was presented at the thirty-third annual meeting of the United States Live Stock Sanitary Association, held in Chicago, December, 1929 (E. S. R., 62, p. 468).

Bang disease (infectious abortion), W. J. Butler (*Mont. Livestock Sanit. Bd. Labs. Contrib., 1 (1930), No. 11, pp. 16*).—This account of infectious abortion includes rules and regulations for the establishment and maintenance of abortion-free accredited herds of cattle and a short review of undulant fever in man and its relation to infectious abortion in animals.

The influence of nutrition on contagious cattle abortion, F. B. Hadley and M. C. Hawn (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 3, pp. 308–320, fig. 1*).—It was found that the "good ration" used in this experiment did not increase resistance to contagious abortion infection, nor did the "poor ration" increase susceptibility. Thus, to date, there is no indication that feed will control contagious abortion, or that resistance to this disease can be increased by building up the mineral or other nutritional reserves of the cow (E. S. R., 63, p. 73).

The double intradermal test for the diagnosis of infectious abortion in cattle, B. H. Edgington and A. Broerman (*Jour Amer. Vet. Med. Assoc., 76 (1930), No. 2, pp. 191–209*).—A contribution from the Ohio Experiment Station, a preliminary report relating to which has been noted (E. S. R., 62, p. 72). Because of the limited number of animals used in the different tests the data are considered insufficient to warrant definite conclusions. It appears, however, that the intradermal test gives a larger percentage of positive reactions than the agglutination test, and that some animals giving negative intradermal reactions harbor *Brucella abortus*. It is thought that a single intradermal injection gives as satisfactory results as a double injection, and that the agglutination titer of animals injected with intradermal abortion may be materially increased temporarily following the injections.

The lesions produced by the Johne bacillus of disease in the peritoneal cavity of the guinea pig, W. A. Hagan and H. L. Mansfield (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 2, pp. 182–190, figs. 4*).—The authors find that peritoneal lesions, especially of the great omentum, are regularly induced by the intraperitoneal injection of the bacillus of Johne's disease in guinea pigs. Attempts to recover these bacilli in cultures failed, and it is believed that they were dead. Similar lesions have been produced in guinea pigs by the intraperitoneal injection of dead Johne bacilli, dead tubercle bacilli, and dead timothy bacilli. It is concluded that the lesions do not represent actual infection of the animal, but are merely the peritoneal reaction to the lipoids of an acid-fast bacillus which is incapable of multiplying in this species.

Liver lesions in Johne's disease, F. P. Mathews (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 2, pp. 248–250, figs. 2*).—In this contribution from the Indiana Experiment Station two cases of liver lesions (Johne's disease) are reported, one in a Holstein cow 11 years of age and the other in a Jersey bull 7 years of age.

Bacteremia due to Salmonella suipestifer, S. E. Branham, L. J. Motyca, and C. J. Devine (*Jour. Amer. Med. Assoc., 94 (1930), No. 22, pp. 1758–1760*).—A report of a human case of bacteremia caused by an organism identified as *S. suipestifer*.

Some observations on Strongyloides stercoralis, C. U. Lee (*Arch. Schiffs u. Tropen Hyg., 34 (1930), No. 5, pp. 262–274, figs. 9*).—Included in this account is a description of methods of collecting various stages of Strongyloides larvae in large numbers free from particulate foreign matter.

Investigations of the nematodes and their larvae.—V, Strongyloides westeri Ihle and its larva [trans. title], J. H. Schuurmans Stekhoven, jr. (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 2 (1930), No. 3, pp. 297–309, figs. 21*).—This is a fifth contribution (E. S. R., 62, p. 560).

The transmission of surra by species of Tabanus: A historical review, H. M. Martin (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 2, pp. 221–238*).—This is a review of the literature presented in connection with a list of 38 references to the literature.

The aetiology of tick-bite fever, A. Pijper and H. Dau (*Jour. Trop. Med. and Hyg.* [*London*], *33 (1930), No. 7, pp. 93, 94, pl. 1*).—The work has shown that tick-bite fever in South Africa is caused by a species of Rickettsia.

The leucocyte formula of the blood of bovines, both normal and affected with piroplasmoses [trans. title], E. Sergent, A. Donatien, L. Parrot, F. Lestoquard, and A. Charpin (*Arch. Inst. Pasteur Algérie, 7 (1929), No. 1, pp. 1–30, figs. 19*).—Part 1 of this account deals with the blood of the normal animal (pp. 2–11); part 2 with the blood of animals affected with *Theileria dispar* and *Anaplasma marginale* (pp. 12–29); and part 3 with the blood of animals with chronic infections, including *Piroplasma bigeminum*, *Babesiella berbera*, and *A. marginale* (pp. 29, 30).

On the nature and therapy of grass staggers, B. Sjollema (*Vet. Rec., 10 (1930), Nos. 20, pp. 425–430; 21, pp. 450–453*).—This is the author's translation of an article previously noted (E. S. R., 62, p. 876).

The handling of shipping fever from the practitioner's standpoint, R. W. Hixson (*North Amer. Vet., 11 (1930), No. 5, pp. 27–35*).—The account presented is based upon some 1,000 cases with particular reference to their treatment with sodium bicarbonate solution, which reduced the mortality to 0.4 per cent.

The occurrence of trichinosis in the Dutch East Indies [trans. title], P. Visser and R. A. Manap (*Nederland. Indische Bl. Diergeneesk., 42 (1930), No. 1, pp. 49–55, pl. 1; Ger., Eng. abs., pp. 54, 55*).—A description is given of the first case of trichinosis to occur in the Dutch East Indies, this having been found among Batak pigs in slaughterhouses at Medan, Sumatra.

Bacterium viscosum equi infection in foals of the heavy breeds, J. F. Bullard (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 2, pp. 250–252*).—This is a contribution from the Indiana Experiment Station reporting upon two cases of joint ill occurring in foals of horses of the heavier breeds due to *B. viscosum equi*, the first ones to be reported in this country as occurring in foals of the heavier breeds.

The patho-anatomical changes in the spontaneous diseases of domesticated birds [trans. title], R. Reinhardt (*Ergeb. Allg. Path. Mensch. u. Tiere, 23 (1930), pp. 553–708*).—A systematic digest of the literature.

The control of bacillary white diarrhea in forced draft incubators by high humidty, D. F. King, L. F. Payne, and L. D. Bushnell (*Poultry Sci., 9 (1930), No. 3, pp. 143–148, figs. 2*).—It was found that a wet bulb reading of 95° F. in the incubator at hatching time practically eliminated the spread of bacillary white diarrhea from infected chicks to noninfected chicks hatching in a forced draft incubator. The mortality to 2 weeks of age in chicks from eggs laid by nonreactor hens and hatched in the same incubator as eggs from reactor hens at the three different wet bulb readings was at 75°, 29 per cent mortality; 85°, 14.6 per cent; and 95°, 6.3 per cent. The control chicks had a mortality of 5 per cent. There is less chick down liberated in the incubator from chicks hatching at a wet bulb reading at 95° than at 85° or 75°.

The sterilization of eggs infected with Salmonella pullorum, R. P. Tittsler (*Poultry Sci., 9 (1930), No. 2, pp. 107–110*).—Studies at the Pennsylvania Experiment Station, summarized in tabular form, show that eggs artificially inoculated by *S. pullorum* must be boiled for five minutes in order to obtain complete sterilization. No difference was noted between large and small eggs. It is pointed out that in general these results confirm those of Rettger, Hull, and Sturges (E. S. R., 35, p. 264).

Transmission of pullorum disease from chick to chick, J. C. Weldin and H. J. Weaver (*Poultry Sci., 9 (1930), No. 3, pp. 176–183*).—In work at the Rhode Island Experiment Station it was found that pullorum disease may be spread from chick to chick through the droppings. While infection may result from the entrance of the organism into the respiratory tract, it is believed that the seat of posthatching infection is more often in the digestive tract.

Fowl-pox antiserum, T. Dalling, J. H. Mason, and W. S. Gordon (*Brit. Jour. Expt. Path., 10 (1929), No. 1, pp. 16–18*).—The authors have found that fowls can be so immunized against fowl pox with injections of living virus that their serum shows marked viricidal properties, as reported by Findlay (E. S. R., 58, p. 880). The degree of protective value of the serum may be estimated by the two methods described, namely, scarification and injection.

Vaccination against fowl pox [trans. title], K. Bierbaum, E. Eberbeck, and K. Rasch (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 36 (1929), No. 4, pp. 233–273, figs. 2; abs. in Internatl. Rev. Poultry Sci., 2 (1929), No. 4, pp. 57, 58*).—In this contribution from the Berlin Veterinary High School the authors report that no immunity was obtained from the use of virus weakened by the addition of carbolic acid and formalin. The fowl pox virus was gradually destroyed by passage on the pigeon, and the same result occurred with the passage of pigeon pox virus on the hen. The pigeon pox virus was found to induce considerable resistance against fowl pox. Excellent results were obtained from the use of a mixture of pigeon and fowl virus.

A new disease of birds in Korea [Chosen] [trans. title], T. Konno, Y. Ochi, and K. Haschimoto (*Deut. Tierärztl. Wchnschr., 37 (1929), No. 33, pp. 515–517, fig. 1; abs. in Trop. Vet. Bul., 18 (1930), No. 1, p. 30*).—This is an account of a disease of poultry which has been found to be identical with Newcastle disease, described by Doyle in England (E. S. R., 58, p. 77). This disease first came under notice in Chosen in 1924 and is nearly always fatal.

Studies on the pathology and physiology of the cecal pouches of turkeys.—II, The utilization of food by turkeys with abligated ceca, J. E. Hunter, A. J. Durant, and A. G. Hogan (*Missouri Sta. Research Bul. 136*

(1930), pp. 12).—In reporting upon studies of cecal abligation as a means of prevention for blackhead in turkeys in continuation of those by Durant (E. S. R., 63, p. 376), the authors deal with its possible effect upon nutrition, although birds previously operated on appeared entirely normal and there was no reason to suspect any disturbance of the digestive or any other functions. The details of the work are reported in tables which present (1) descriptions of the turkeys and record of food consumption, (2) weight of nutrients consumed, (3) weight of constituents in excreta (by analysis and by calculation), (4) calculation of coefficients of digestibility, and (5) coefficients of digestibility, entire period. The authors conclude that the data give no evidence of a lower digestibility of rations as a result of cecal abligations.

AGRICULTURAL ENGINEERING

[Irrigation investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1929, pp. 59–64, 66–70*).—The progress results of investigations conducted by the station in cooperation with the U. S. D. A. Bureau of Public Roads on duty of water for various crops, rate and cause of rise of ground water in the Mesilla Valley, and on rainfall supplemented by underground water in the production of crops of low water requirements are briefly reported, no conclusions being drawn.

The use of windmills in irrigation on the high plains, F. P. Eshbaugh (*[Oklahoma] Panhandle Sta., Panhandle Bul. 16 (1930), pp. 3–13, figs. 5*).—Data from service tests of a 12-ft. windmill operating a 2.75-in. force pump under a 140-ft. lift are briefly reported and discussed, no conclusions being drawn.

Laboratory studies on toxic chemical control of wood destroying fungi, H. T. Barr (*Agr. Engin., 11 (1930), No. 4, pp. 161–163, figs. 3.*)—Studies conducted at the Arkansas Experiment Station are reported.

The results showed that some chemicals not soluble in water are toxic to certain wood-destroying organisms. The copper compounds used can be precipitated out in the wood. Copper borate shows promise as a wood preservative because of its toxic value, permanency, and relatively low cost. Refuse cylinder oil has very little retarding effect upon the growth of fungi, and does not prevent their growth. The specimens given the commercial treatment resisted leaching to a high degree, and this treatment prevented growth of fungi.

Public Roads, [May, 1930] (*U. S. Dept. Agr., Public Roads, 11 (1930), No. 3, pp. 41–60+[2], figs. 24*).—This number of this periodical contains the status of Federal-aid road construction as of April 30, 1930, together with the following articles: A Technical Basis for Apportioning Motor Vehicle Taxes, by C. F. Marvin, jr. (pp. 41–50), and A Method of Analysis of Data on Frost Occurrence for Use in Highway Design, by J. A. Sourwine (pp. 51–60).

Field and laboratory studies of fertilizer distributors for cotton, G. A. Cumings, A. L. Mehring, and W. H. Sachs (*Agr. Engin., 11 (1930), No. 4, pp. 149–160, figs. 5*).—Studies conducted under a cooperative agreement between the Joint Committee on Fertilizer Application, the South Carolina Experiment Station, and the U. S. D. A. Bureaus of Public Roads and Chemistry and Soils are reported.

The results indicated that irregular distribution of fertilizer is caused by variable wheel slippage, cycles of delivery, lack of refinement of the distributing mechanism, changes in the depth of fertilizer in the hopper, tilting of the machine, and inability of the fertilizer to flow uniformly. Segregation of fertilizer components occurs to a greater or less extent in all machines.

Some factors contributing to ease of operation of the machines are light weight and compact construction of walking machines, adequate hopper capacity, easy accessibility for cleaning, and convenient adjustments for delivery rate. It is either difficult or impossible to adjust a majority of the machines reasonably close to the rates desired. Combination machines as a class will not deliver fertilizers of the usual grade at a rate frequently used in the Southeastern States. Uniform depth of planting is possible only when the furrow opener with an effective depth gage is free to follow the surface of the seed bed.

It was indicated that under the conditions of this study fertilizer is most efficient when uniformly applied relatively close to the seed but not in contact with it.

RURAL ECONOMICS AND SOCIOLOGY

Regional changes of farm animal production in relation to land utilization, O. E. Baker (*U. S. Dept. Agr., Bur. Agr. Econ., 1929, pp. [1]+47, pls. 70*).—This multigraphed preliminary report shows the regional changes in the average number of livestock, 1917–1921, 1922–1926, and January 1, 1929; the regional distribution of tractors and automobiles and the associated changes in the number of horses and mules; the approximate quantity of crops required by horses and mules during the periods 1917–1921 and 1922–1926; and the regional changes in home-grown crop feed available for meat and milk animals. The regional changes in the numbers of meat and milk animals and production of animal products and the prospect for the continued concentration of meat and milk production in the North Central States are discussed.

The stock-share lease, W. E. Grimes (*Kansas Sta. Circ. 155 (1930), pp. 16*).—The advantages, limitations, and provisions of, and conditions favorable to, stock-share leases are described, with special reference to Kansas conditions.

Truck farming in the Marietta section, Washington County, Ohio, 1920–1924, S. C. Hartman (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 20 (1929), pp. [2]+57, figs. 5*).—This study of the plan of organization, system of management, and farm practices is based upon 5-year records from 63 representative truck farms. Tables are included and discussed showing for the period and the several years for the 63 farms the average acreages used for different purposes, capital invested, receipts from different sources, expenses, yields, value, and prices of truck crops, farm income, labor income, etc. Other tables give business summaries for the period for 9 successful and 9 unsuccessful valley farms and the 6 more and the 6 less successful hill farms, and for each year 1920–1922 for 12 hill farms and for 14 nontruck hill farms for which data were obtained in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

The study shows that while the average acreage of truck crops per farm increased from 7.1 to 8 acres from 1920 to 1924, the labor employed reduced to years decreased from 2 to 1.9 years. Truck crop production per man was the important factor in determining income. High production was secured by either a large acreage or an average acreage and high yields.

Farm land values in Kansas, H. Howe (*Kansas Sta. Circ. 156 (1930), pp. 12, figs. 7*).—Tables and charts are included and discussed showing index numbers, by years 1920–1929, of farm land values in the United States, Kansas, and nearby States, and the trends of land values in 1910–1928 in the corn, general farming, bluestem, eastern wheat, western wheat, and western grazing sections of Kansas.

Farm price indexes in the United States of America [trans. title], R. FREUND (*Weltwirtschaft. Arch., 31 (1930), No. 1, pp. 259–285*).—A description and discussion of the index numbers of prices of agricultural products developed and used by different investigators.

The 1930 outlook for flue-cured tobacco (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. [1]+14, figs. 3*).—A mimeographed analysis of the domestic consumption, exports, stocks, and probable plantings and prices in 1930 and prices in 1930–31.

The 1930 outlook for Burley tobacco (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. [1]+8, fig. 1*).—A mimeographed report similar to that noted above.

Present status of the farmer owned elevators of Ohio with some comparisons with conditions in 1924, B. A. WALLACE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 21 (1929), pp. [2]+14*).—Tables are given and discussed showing for 119 companies operating 138 elevators grouped in 5 groups on the basis of volume of business done, the surplus or deficit at the beginning of 1928, capital stock, net worth, gains or losses, trading margins, distribution of expenses, etc., during the fiscal year 1928 or 1928–29, together with comparisons for 1924 and 1928 of capital, net worth, assets, notes payable, accounts receivable, etc., for companies where comparisons were possible.

Cooperative marketing of fluid milk, H. METZGER (*U. S. Dept. Agr., Tech. Bul. 179 (1930), pp. 92, figs. 11*).—The findings of a study of fluid milk marketing organizations in the United States completed in 1929 are presented. The development of such organizations in different sections, types of organizations, pooling practices, financing of cooperative organizations and their control plans, and price plans and policies are analyzed and discussed. A number of representative associations are described.

Crops and Markets, [May, 1930] (*U. S. Dept. Agr., Crops and Markets, 7 (1930), No. 5, pp. 153–192, figs. 3*).—Included are tables, reports, etc., of the usual types, together with tables showing the ocean freight rates on wheat to the United Kingdom from the United States, Canada, Argentina, India, and Australia, 1913 and 1922–1929, and indexes, by States, of estimated farm real estate values per acre, 1920 and 1925–1930.

Accounts for Kansas farms, M. EVANS and I. N. CHAPMAN (*Kansas Sta. Circ. 150 (1929), pp. 35, figs. 4*).—Forms and directions for their use in keeping and analyzing farm accounts are included. An appendix contains miscellaneous data as to grain and hay measurements and weights of seeds and fruits.

Social relationships of Slaterville Springs—Brooktondale area, Tompkins County, New York, G. A. BAKKUM and B. L. MELVIN (*New York Cornell Sta. Bul. 501 (1930), pp. 55, figs. 26*).—This bulletin analyzes the data obtained from families and local organizations in an 18 months' study begun in 1925 of an area of approximately 90 square miles from 4 to 12 miles from Ithaca, N. Y. The communication facilities, origin and sex and age distribution of the population, size of farms, home ownership, occupations, economic and professional services, the educational and religious situations and their relationships, the special-activity groups, locality groupings, and the social changes in the area are described and discussed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the forty-third annual convention of the Association of Land-Grant Colleges and Universities, edited by C. A. McCUE (*Assoc. Land-Grant Cols. and Univs. Proc., 43 (1930), pp. 477, pl. 1, figs. 23*).—This is the customary report of this convention (E. S. R., 62, p. 88) held at Chicago, Ill., November 12–14, 1929, and previously discussed (E. S. R., 62, pp. 1, 101, 200.)

The following papers and addresses, together with discussions, are included: Presidential address—National Aspects of Land-Grant Colleges and Universities, by A. Marston (pp. 27–38); What Is Ahead for the Land-Grant College? by E. Davenport (pp. 38–41); Memorial to Dr. A. C. True, by E. W. Allen (pp. 41–45); Minute Concerning the Late Dr. Edwin West Allen, by J. L. Hills (pp. 45–47); Address of the President of the National Association of Broadcasters, W. S. Hedges (pp. 48–54); Address of the Director of Agriculture, National Broadcasting Company, F. E. Mullen (pp. 55–58); Address of the Commissioner of Education, U. S. Department of the Interior, W. J. Cooper (pp. 59–67); The Use of Radio by Land-Grant Institutions, by F. D. Farrell (pp. 67–73); Address of the Secretary of Agriculture, A. M. Hyde (pp. 79–83); remarks and addresses by C. S. Wilson, J. C. Stone, A. H. Legge, C. Williams, S. R. McKelvie, and C. C. Teague, of the Federal Farm Board (pp. 73–78, 83–97); Extension Work in Cooperative Marketing, by C. W. Warburton (pp. 98–104); An Advancing Program of Agricultural Extension Work, by B. Knapp (pp. 104–109); Need for the Promotion of Fundamental Research and Correlation of Work in the Interest of Agriculture and the Mechanic Arts, by A. F. Woods (pp. 109–113); Relation of Colleges of Agriculture to Commercial Educational Workers, by D. T. Gray (pp. 114–123); "Read While You Run," by E. M. Freeman (pp. 123–134); Results of a Study of Student Enrollment in Agriculture, by J. A. James (pp. 135–142); Current Efforts to Improve College Teaching, by F. W. Reeves (pp. 143–149); What Should Be the Education of the Farmer? by F. D. Farrell (pp. 149–153); Evolution in the Subject Matter and Teaching of Agricultural College Courses with Special Reference to Laboratory Work, by W. L. Burlison (pp. 153–161); Relation of Fundamental Science Departments to the Agricultural Curriculum, by H. L. Walster (pp. 161–166); An Experiment in Teaching, by H. H. Whetzel (pp. 167–179); Fellowships and Their Relation to Research, by H. L. Russell (pp. 179–182); Relation of the Physical and Biological to the Social Sciences in Agricultural Research, by B. Youngblood (pp. 183–190); A National Program for the Survey and Coordination of Farm Structures Research, by H. Giese (pp. 191–196); The Agricultural Experiment Station as a Training Ground for Industry, by C. R. Moulton (pp. 196–202); Staff Attendance at National and Regional Meetings, by W. W. Burr (pp. 205–209); Experiment Station Publicity, by A. W. Hopkins (pp. 209, 210); Experiment Station Publicity as Seen by an Extension Worker, by C. F. Monroe (pp. 210–219); Further Development of Extension Work, by G. E. Farrell (pp. 224–228); Types of Farm Organizations that Are Carrying Out Extension Work Most Effectively, by J. C. Kendall (pp. 228–244); The Extension Director, His Duties and Responsibilities, by C. E. Ladd (pp. 244–248); Effective Methods of Creating Sentiment for the Employment of Home Demonstration Agents, by K. Van A. Burns (pp. 248–251); What Constitutes a Good Extension Specialist and What Are His Duties? by W. H. Brokaw (pp. 252–256); The Influence to Date of Smith-Lever Extension Work on Rural Life in the United States, by H. W. Mumford (pp. 256–263); To What Extent Should an Extension Program Be Built upon the Economic Information Such as Is Developed by the Annual Outlook Conference? by R. K. Bliss (pp. 265–268); Leave for Professional Improvement, by C. B. Smith (pp. 268–273); Relation of Research to Teaching, by H. V. Carpenter (pp. 274–276) and by E. B. Norris (pp. 276–278); The Status of Engineering Experiment Station Legislation, by F. E. Turneaure (pp. 286–290); Art and Engineering, by R. L. Sackett (pp. 295, 296); Organization of Engineering Curricula, by H. S.

Rogers (pp. 297–305) and by I. C. Crawford (pp. 305–307); Liberalizing Engineering Curricula, by P. Cloke (pp. 308, 309) and by R. W. Goddard (pp. 309–311); Placement of Engineering Graduates Before and After Graduation, by J. R. Bangs, jr. (pp. 320–329); Placement of Engineering Students Before and After Graduation, by J. E. Walters (pp. 330–339); Limitation of Enrollment in Engineering Schools and Colleges, by G. W. Case (pp. 346–352) and by H. W. Moody (pp. 353–356); The Overcrowding of the Undergraduate Curriculum with the Resulting Elimination of Elective Work.—Is the Junior College the Answer? by J. W. Harris (pp. 358–362); What Should Replace the Elementary Courses if They Are Omitted? by M. L. Matthews (pp. 362–365); Home Economics Materials for Study, by A. Klein (pp. 365–367); What Constitutes the Home Economics Point of View in Research, by S. L. Smith (pp. 367–371); Some Interrelationships of the Graduate School, Research, and Home Economics, by R. E. Buchanan (pp. 371–379); Home Economics in the Field of Adult Education, by J. D. Willard (pp. 379–382); An Informational Memorandum on the White House Conference on Child Health and Protection, by H. E. Barnard (pp. 383–387); A Study of the Contractual Relationships in the Institutions of the Land-Grant College Association, by J. A. Burruss (pp. 414–419); Report Upon Progress of the Land-Grant College Survey, by A. J. Klein (pp. 419–424); and "And Including Military Tactics," by J. M. Thomas (pp. 426–432).

Reports of the committees and officers are also included.

Marketing and housework manual, S. A. Donham (*Boston: Little, Brown, & Co., 1930, pp. X+249, pls. 4*).—This is a new edition of the text previously noted (E. S. R., 39, p. 195).

FOODS—HUMAN NUTRITION

Blackberry jelly, blackberry jam, and cherry preserves, H. Cameron (*West Virginia Sta. Circ. 55 (1930), pp. 12*).—This circular contains practical directions for the preparation in the home of blackberry jelly and jam and cherry preserves as developed through a laboratory investigation to be reported in bulletin form.

Directions for the blackberry jelly include simple pectin and acid tests to be used in determining the proportion of sugar to add and three methods of determining doneness, of which cooking to calculated weight is considered the most accurate. A score card for judging the finished products and a list of jelly failures and their causes are included.

The directions for the blackberry jam are those which have been developed in an effort to standardize the product under the Mountain State Brand label. All jams carrying this label must score 90 or above from the sample sent to the station.

In making cherry preserves, another marketable home product, the points considered of chief importance are the variety and ripeness of the cherries, the amount and method of adding the sugar, and the temperature of cooking. All of these are discussed, and the recipe which has been developed is given in detail.

The normal diet, W. D. Sansum (*St. Louis: C. V. Mosby Co., 1930, 3. ed., rev., pp. 134, fig. 1*).—This revision of the volume previously noted (E. S. R., 58, p. 388) contains additional sample menus for special diets.

Food habits of Georgia rural people, S. J. Mathews (*Georgia Sta. Bul. 159 (1929), pp. 31, figs. 7*).—For the purpose of determining how nearly the diets of Georgia rural people approach the accepted standards of adequate nutrition, 100 average families in the northern part of the State and the same number in the southern part were selected and records obtained of their food consumption during a period of 2 weeks in each of the four seasons of the year, records for the southern group being collected from September, 1925, to September, 1926, and for the northern from September, 1926, to September, 1927.

Analyses of the records according to the methods employed in recent food consumption studies in various States are reported, with the conclusion that the average composition of the diets was adequate in calories, protein, and calcium, slightly deficient in phosphorus, and seriously deficient in iron. Of the individual family diets, 44.7 per cent were low in calories, 37.8 in protein, 30.5 in calcium, 50.6 in phosphorus, and 77.4 in iron. Calculated in terms of 3,000 calories, the deficiencies in everything except iron were slightly less, but the deficiency in iron even greater.

In comparison with the customary standards for the different food groups, the diets were relatively low in lean meat, eggs, dairy products, fruits and vegetables, and high in fats, cereals, and sweets, the distribution being as follows: Meat, eggs, and cheese 11.1, milk and cream 9.5, fats 24.7, sweets 12.1, cereals 33.6, and fruits and vegetables 9.3 per cent.

A comparison of the diets of 45 landowners and 45 tenants showed higher average values for calories, protein, calcium, and phosphorus in the diets of the tenants and a higher iron content in the average diet of the landowners. Seasonal variations in the diets were not great, but were more evident in the diets in the southern group than in the northern. The content of energy, protein, and iron was highest in the winter, due to the use of more meats and sirup, and of calcium in the spring, due to the use of more milk.

Practically all the milk and butter used were produced on the farm, but considerable cheese was purchased. Not including watermelons, only 60 per cent of the fruit used was produced on the farm. The fruits purchased in largest quantities were apples, grapefruit, oranges, and bananas. Less fruit was purchased in the northern than in the southern part of the State. Of the vegetables used, 87.5 per cent were produced on the farm. The vegetable purchased in largest quantities was the Irish potato, with cabbage ranking next.

The author concludes that the average production of foods on the farm was not of sufficient variety to provide an adequate diet and that a better diet, better health, and a higher standard of living will result from increased production of foods on the farm.

The adequacy of the diet of Texas school children (*Texas Sta. Rpt. 1929, pp. 90, 91*).—In this progress report the general plan of the investigation is outlined briefly as following two distinct lines: "(1) A general qualitative study of the character of the diet of a rather large number of representative school children in each of six well differentiated regions of Texas, and (2) an intensive, quantitative study within each region of a smaller number of children who differ in age and degree of physical well-being. Three race groups—white, Mexican, and negro—are included in the study."

In the qualitative study records are being obtained from the children for 8 consecutive days at two seasons of the year of their dietary habits and food likes and dislikes. The records for seasons have been completed for approximately 1,000 white school children in three counties, 250 Mexican children in one county, and 850 negro children in two counties. In all cases weight and height measurements and teeth examinations have been made. Although the work is not yet completed, it has been found that the distribution of the diet scores for the white children is quite similar to that for the Mexican children in the same region. Although the Mexicans have a less varied diet, it meets the demands of adequacy to about the same extent. Differences in locally produced food in different sections included in the study have not seemed to make any differences in the food selection.

Growth in height and weight of Texas school children (*Texas Sta. Rpt. 1929, pp. 91, 92*).—To determine whether or not representative Texas school children exhibit seasonal variations in their growth curves and whether there are any significant differences in the physical development of the three race groups, white, Mexican, and negro, periodic growth measurements are being taken of more than 500 pupils of each race in three of the San Antonio public schools, along with qualitative diet records and other significant data.

In the preliminary work, the importance of uniformity in conditions under which the data are collected was demonstrated. Failure to empty the urinary bladder before weighing was found to make differences of from 2 to 8 oz. in the weight of individual children, the differences often equaling the true body gain. Variations in the weight of the clothing of different children and of the same children from month to month were found to be in excess of the expected monthly gain of from ¼ to 1 lb. in children below adolescence. The extremes of clothing weights in one month for the different children weighed were 15 oz. and 8 lbs. 1 oz., while monthly variations for the individual children were often 1½ to 2 lbs. To avoid such variations uniform weighing garments are used.

Metabolism of women during the reproductive cycle, I–III (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 17–74, figs. 5*).—The three studies noted below form a part of an extensive investigation of the metabolism of women during the entire reproductive cycle, including both pregnancy and lactation.

I. *Calcium and phosphorus utilization in pregnancy*, I. G. Macy, H. A. Hunscher, B. Nims, and S. S. McCosh (pp. 17–35).—"In this preliminary report, data concerning the calcium and phosphorus metabolism of three women at different stages of the gestation period are given with the primary interest of observing the metabolic response of the maternal organism to the physiological changes coincident with the development of the fetus and the preparation for lactation." Before presenting the data, the authors discuss, with many references to the literature, the various factors already known or thought to influence the metabolism of women during the reproductive cycle. The three women acting as subjects in the present study had just completed a year of heavy milk flow, all being superior milk producers in the Mother's Milk Bureau of Detroit. Two of them were known to be storing appreciable quantities of calcium and phosphorus at the sixtieth and fiftieth week, respectively, of the lactation period immediately preceding.

The metabolism studies were conducted for 4-day periods at 4-week intervals during the last half of pregnancy. No changes were made in the customary diets, but only distilled water was used. The metabolic studies were accompanied by systematic detailed psychological observations. Complete oral examinations with röntgenograms of the teeth were made at the beginning and end of pregnancy, and röntgenograms of the long bones of the infants were made on the tenth and forty-second days after birth.

For the three subjects the daily food intake varied in calories from 2,400 to 3,600, in nitrogen from 11.6 to 23.6 gm., in calcium from 1.5 to 2.7 gm., and in phosphorus from 1.5 to 3 gm. The diets had a tendency toward alkalinity, the values of excess of base over acid varying from 4 to 30 cc. of N/10 base.

In only one subject was there a negative nitrogen balance, this being observed in the thirty-fourth week of pregnancy. In spite of the large intake of calcium and phosphorus, excessive excretion occurred. The calcium balances were negative in the first subject at the twenty-sixth and thirtieth weeks, in the second at the fourteenth week, and in the third at the thirtieth and thirty-fourth weeks. The phosphorus balances were positive throughout except in the twenty-sixth week for the first subject and the thirty-fourth for the third. It is noted that the first subject was undergoing great worry and anxiety at the time when the balances of calcium and phosphorus were both negative, thus pointing to an effect of mental state upon physiological processes. Aside from these negative balances, there were noticeable variations in the metabolism of both calcium and phosphorus of different individuals at the same time and in the same individual at different times. No attempt is made to interpret these findings, but it is emphasized that "this report shows a practical need for scientific information concerning the calcium and phosphorus metabolism of women living in their usual home environments and consuming their accustomed diets during the reproductive cycle."

II. *Calcium and phosphorus utilization in two successive lactation periods*, H. A. Hunscher (pp. 37–57).—The metabolism studies reported in this paper were conducted on the same three subjects as in the study noted above. Calcium and phosphorus balances were determined for the first two subjects for periods of 10 days, beginning at the sixtieth and fiftieth week, respectively, of the lactation period immediately preceding the pregnancies during which the data reported in the previous paper were obtained. During the lactation period following these pregnancies, calcium and phosphorus balances were determined for all three subjects in 4-day periods during the seventh week of lactation and also during the twenty-seventh week for the first and third and the twenty-sixth week for the second subject. The weights of 24-hour samples and the total content of calcium and phosphorus in the milk were also determined at monthly periods during the lactation in both series, and at the time these analyses were made quantitative studies of the voluntary food consumption were also made.

The balances of both calcium and phosphorus were positive in the late period of the previous lactation, when the milk flow had considerably decreased, and were negative in the early period of the following lactation. After six months of continued high milk production the losses in calcium were still greater. Of the eight phosphorus balances, four, two in the late and two in the midlactation periods, were positive. The latter were accompanied by increased calcium losses.

The percentage distribution of calcium varied in the three women from 8.3 to 38.3 per cent in the milk, from 59.4 to 89.6 in the feces, and from 1.6 to 9.3 per cent in the urine. The lowest values in the urine were during periods of high milk production. In the period of storage of calcium in midlactation, there was a decrease in the proportion of calcium excreted in the urine. The ratios of calcium to phosphorus excreted increased from early to midlactation and decreased in late lactation.

Dietary studies showed an intake of between 3,700 and 4,700 calories, between 27.8 and 29.4 gm. of nitrogen, between 2.8 and 4.4 gm. of calcium, and between 2.9 and 4.3 gm. of phosphorus.

A final comparison of the calcium exchange during pregnancy and lactation showed for all three subjects a larger consumption of these elements during lactation than during pregnancy, but in early and late lactation an excessive fecal excretion resulting in negative balances. In discussing the inability of the organism to utilize the increased available food during lactation, the author suggests as a possible explanation that "there was not a sufficient amount of the calcium fixation substances present in the diet or environment, or there were other regulatory factors operating within the maternal body to inhibit the absorption and utilization of the calcium and phosphorus available in the digestive tract during the seventh and twenty-seventh weeks of lactation cycle B."

III. *Calcium, phosphorus, and nitrogen utilization in lactation before and after supplementing the usual home diets with cod liver oil and yeast*, I. G. Macy, H. A. Hunscher, S. S. McCosh, and B. Nims (pp. 59–74).—Shortly after the final metabolism determinations in the previous study, the three subjects were given as daily supplements to their regular diet 15 gm. of cod-liver oil and 10 gm. of yeast over a period of 2 months, at the end of which the calcium and phosphorus metabolism was again determined.

In the first of the three subjects a marked negative balance of calcium was changed into a positive balance, and in the other two there was an appreciable reduction in the elimination of calcium. The phosphorus utilization was also affected favorably. The only negative balance, that of the third subject, became positive, and the other two subjects showed an even greater retention. There was a marked decrease, both relative and absolute, in the fecal excretion in both calcium and phosphorus. The nitrogen metabolism was not altered appreciably. The three subjects experienced a greater feeling of well-being after the addition of these supplements to the diet.

In conclusion, available data from the literature dealing with factors influencing the assimilation of calcium and phosphorus are summarized and dscussed.

The retention of nitrogen, calcium, phosphorus, and magnesium by pregnant women, C. M. Coons and K. Blunt (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 1–16, figs. 3*).—This paper reports a total of 23 4- to 6-day metabolism studies carried out on nine different women from the eleventh to the thirty-ninth week of pregnancy. On two of the women five balance periods each were observed, on three three periods each, and on four one period only. No attempt was made to control the dietary habits or living conditions of the subjects.

The reported data show considerable variability in behavior in the different women and in the same woman at different periods. The nitrogen retention tended to vary with the intake and was in general higher in midpregnancy than later. This difference was attributed in some instances to voluntary restriction in the protein in later months and in others to the undernourished condition of the mother at the beginning of pregnancy. The calcium retention was also somewhat irregular, but with a marked tendency to rise toward the end of pregnancy. In the three subjects whose retention was highest, the increase began about the fourth month and continued gradually to about 0.2 gm. daily for the ninth month and then more steeply to 0.3 gm. by the last week. The amounts of calcium stored by most of the women were much less than these figures and also less than the amounts reported in the published analyses of fetuses.

The phosphorus retention tended to rise to from 0.15 to 0.2 gm. daily by the fifth month and then remained at a level of from 0.2 to 0.3 gm. until the end of pregnancy. The first increase corresponded to periods of high nitrogen retention in midpregnancy and the second to periods of high calcium retention toward the end of pregnancy.

The retention of magnesium was irregular and inconsistent. A high magnesium intake resulting from the ingestion of Bisodal or milk of magnesia seemed to have no effect on the calcium retention.

Röntgenograms of the wrists and ankles of most of the babies on the eighth day after birth showed differences which closely paralleled the mother's good or bad retention of calcium. Greater success in lactation appeared to follow higher nitrogen retention.

The effect of grape juice on nitrogen retention and urinary acidity, L. M. PICKENS and R. A. HETLER (*Jour. Home Econ.*, *22* (*1930*), *No. 1*, *pp. 44–48*).—In the metabolism experiments reported, the addition of a quart of grape juice daily to the basal diet of Pickens and Arnold (E. S. R., 59, p. 188) led to a significant increase in nitrogen retention in the three normal women serving as subjects. This was also true when the basal diet was supplemented by glucose to furnish the same amount of calories as did the grape juice. This is thought to indicate that the carbohydrate of the grape juice exerted a protein-sparing action, and the same explanation is suggested for similar results obtained by Chaney and Blunt for orange juice (E. S. R., 55, p. 793).

In the total of five grape juice metabolism experiments only one showed any decrease in urinary acidity (increase in pH) over the corresponding basal experiment, and in three the urinary acidity was slightly increased. It is suggested that an organic acid, perhaps tartaric, is excreted in some form in the urine, but that whatever the explanation grape juice does not function materially in decreasing the acidity of the urine.

Grape juice and acidity of the urine (*Jour. Amer. Med. Assoc.*, *94* (*1930*), *No. 14*, *pp. 1070*, *1071*).—In this editorial comment on the findings of Pickens and Hetler noted above, attention is called to one puzzling aspect of the behavior of unfermented sweetened grape juice because of the fact that raisins are known to decrease the acidity of the urine. "In view of the growing tendency to adopt dietotherapeutic alkalization by means of fruits and fruit juices, it is well to point out that not all fruits are effective in this regard."

Endogenous obesity—a misconception, L. H. NEWBURGH and M. W. JOHNSTON (*Jour. Amer. Dietet. Assoc.*, *5* (*1930*), *No. 4*, *pp. 275–285*, *figs. 7*).—In this paper, presented before the 1929 meeting of the American Dietetic Association, the authors discuss the occasional failures in attempts to reduce weight by dietary restriction and show from their own hospital experience that such failures are of short duration and always followed by excessive loss in weight until the total loss corresponds with the expectation. Tabulations of water exchange in obese subjects are presented to show that the body weight is a resultant of two factors: (1) Gain or loss in tissue and (2) gain or loss in water. A large retention of water may consequently cause a gain in weight even when the body tissue is being consumed.

A study of the blacktongue preventive value of leached commercial casein, together with a test of the blacktongue preventive action of a high protein diet, J. GOLDBERGER, G. A. WHEELER, L. M. ROGERS, and W. H. SEBRELL (*Pub. Health Rpts.* [*U. S.*], *45* (*1930*), *No. 6*, *pp. 273–282*).—To determine whether the slight delaying effect of casein on the recurrence of pellagra in the investigation with human subjects noted previously (E. S. R., 53, p. 662) was due to the presence of a small amount of the pellagra-preventive factor in the casein, and also whether high protein diets have effect in delaying or preventing experimental blacktongue in dogs, several dogs were fed the basal experimental diet for the production of blacktongue (E. S. R., 60, p. 793) supplemented with varying amounts of casein. On the basal diet alone, containing 60 gm. of casein per 2,400 calories, blacktongue developed in from 26 to 63 days.

When the casein was doubled the time of onset of blacktongue varied from 65 to 263 days, but when the cowpeas were removed from the ration and the casein increased to 150 gm. per 2,400 calories the time of onset of blacktongue was shortened from 25 to 67 days.

These results are thought to indicate that leached casein carries with it a small amount of the antipellagric factor which, together with the amount already present in the diet (cowpeas), is sufficient to delay the onset of the disease but not entirely to prevent it. The failure of the high casein diet to delay the onset of blacktongue is thought to disprove any effect of high protein in delaying the onset of pellagra.

Vitamin content of ethylene-treated and untreated tomatoes, D. B. Jones and E. M. Nelson (*Amer. Jour. Pub. Health, 20 (1930), No. 4, pp. 387–394, figs. 3*).—The tomatoes used in this investigation at the Bureau of Chemistry and Soils, U. S. D. A., were a purebred strain grown especially for the ethylene studies and were collected at three stages of development: (1) Immature green in which the chlorophyll had not begun to fade; (2) mature green in which the chlorophyll had begun to fade, but which were not ripe, and (3) mature vine-ripened fruit. Some of both lots of the green tomatoes were left untreated, and the rest were given five successive treatments with ethylene gas, 1:1,000, in sealed earthen jars. All of the tomatoes were ground in a meat grinder, mixed thoroughly, heated in a steam bath, placed in cans while hot, sealed, and processed according to the usual cannery practice. In the vitamin tests only that portion of the fruit which passed through a fine muslin cloth was used.

In the vitamin A tests, the technic previously described (E. S. R., 60, p. 894) was followed, two series of experiments being run with all of the different lots. In one the feeding was begun after definite signs of ophthalmia had appeared and was continued for 5 weeks, after which the basal diet alone was fed until the animals showed considerable loss in weight. In the other the tomato feeding was continued for 8 weeks. In the vitamin B (F) tests a basal vitamin B-free diet was used, supplemented by 5 per cent of yeast autoclaved 4 hours at 15 lbs. pressure. Two series of experiments were run, the second beginning nearly 3 months later than the first. The tomatoes were fed from the beginning of the experimental period. In testing for vitamin C, scurvy symptoms and post-mortem findings were used as criteria in one series and the survival periods in a second series. In the A and B tests 5 cc. and in the C tests 1 cc. of tomato juice were fed daily.

In all of the tests the naturally ripened tomatoes gave the best results. No marked difference could be detected between the A content of the green tomatoes picked at different stages of development whether treated with ethylene or not. In the B tests consistently better results were obtained in the first series than in the second after storage of the canned product for 3 months, but the ethylene-treated lots gave no better results than the untreated. In the C tests fully grown green tomatoes ranked next to the vine-ripened and the small immature came last. The ethylene treatment of the fully grown green tomatoes, although changing the color to within the range of commercially canned tomatoes did not change the C content appreciably.

The authors conclude that "in so far as the use of tomato juice as a source of vitamins is concerned, the results of our work indicate that vine-ripened tomatoes are preferable to those picked green and treated with ethylene gas to develop the color characteristic of ripe fruit. No indication was observed that the ethylene treatment had any deleterious effect upon vitamins already developed."

Experiments on vitamin A deficiency in rats and the quantitative determination of vitamin A, S. V. Gudjónsson (*Acta Path. et Microbiol. Scand., Sup. 4 (1930), pp. 189, figs. 72; Danish abs., pp. 178–182*).—This monograph, translated from the Danish by H. Andersen, constitutes the detailed report of an extensive investigation of the effects of vitamin A deficiency in rats and of the technic for the quantitative determination of vitamin A. Of especial value is the discussion, based upon the author's researches and upon the literature on the subject, of the influence of various factors upon the response of the animal to deficiencies in vitamin A. In the author's opinion the three factors of greatest significance are the living conditions of the animals, seasonal differences, and breed. Section 1 of the report deals chiefly with the significance of these factors during the foreperiod and section 2 with the experimental period proper. Section 3 consists chiefly of the details of the technic as finally developed for determining vitamin A.

The vitamin A content of the diet of the breeding animals was considered to be the most important factor in causing variations in behavior of different animals on the vitamin A-free diet. The breeding diet finally adopted as most satisfactory consists of skim milk powder 30, rice flour 40, dried autolyzed top yeast 15, and coconut oil and shark liver oil 15 per cent. The amount of the shark liver oil is adjusted with different batches to furnish about 2½ times the optimal dose of vitamin A. On this diet seasonal variations in weight are said to be insignificant, and the storage of vitamin A to be so small that the foreperiod is short and the weight increases during this period are slight. The reserve supplies of vitamin A are so small and uniform that prophylactic rather than curative tests are recommended. The vitamin A-free diet adopted consists of purified casein 18, rice starch 54, dried autolyzed top yeast 5, salt mixture (McCollum 185) 5, purified agar 3, and lard 15 per cent. No provision for vitamin D is made.

In describing the pathological conditions in rats on a vitamin A-free diet, emphasis is placed on the almost complete disappearance of adipose tissue. Next to xerophthalmia this is considered to be the most conspicuous symptom of vitamin A deficiency. Abscesses at the base of the tongue come next in importance, followed by infections of the urinary organs, with concretions and hemorrhages.

A list of 197 references to the literature is appended.

Bacteria of the upper respiratory tract and middle ear of albino rats deprived of vitamin A, R. G. Turner, D. E. Anderson, and E. R. Loew (*Jour. Infect. Diseases, 46 (1930), No. 4, pp. 328–334*).—This report gives the results of a further investigation of the bacteria encountered in the lesions of rats on a vitamin A-deficient diet (E. S. R., 62, p. 493), as determined by studies of cultures taken from the nasal cavities and middle ears of 55 rats on a vitamin A-deficient diet and 14 controls. The experiments were carried out through the fall, winter, and spring of 1928–29. The animals differed from those in the earlier study in having a greater storage of vitamin A at the beginning of the experiment, consequently the development of xerophthalmia was not as extensive or as rapid as in the animals in the previous group. For purposes of comparison the animals were divided into four groups consisting, respectively, of normal animals from the stock colony, controls on the basal A-free diet plus cod-liver oil, all of the animals on the A-deficient diet which developed xerophthalmia, and all on the deficient diet which did not develop xerophthalmia.

Four types of organisms pathogenic to rabbits were encountered—*Staphylococcus aureus, Bacillus coli, Micrococcus catarrhalis* A, and chromogen 6. Of these, the last two, both of which are Gram-negative cocci, were encountered more frequently in animals which showed the most severe symptoms of A deficiency. This was particularly true of chromogen 6. "It is believed that these organisms gain a pathogenic hold during the depressed state of their host resulting from vitamin A deficiency."

The percentage of sterility was highest in the animals of the second group (basal diet plus cod-liver oil) and lowest in those of the third group (suffering from xerophthalmia). In the fourth group (nonxerophthalmic), the percentage of sterile cultures was greater than in the xerophthalmic group, but less than in stock and control animals. Infection was absent in the posterior nasal aperture and ethmo-turbinal regions, and pus present in 16 per cent of the middle ears examined. Since no suppurations were found in control or stock rats and the middle ear only in animals from group 4 showed infection, "it appears as though the site of infection is the middle ear from which the nasal cavities and sinuses become diseased as the resistance becomes less."

Infection of accessory sinuses and upper respiratory tract in vitamin A deficiency, B. R. Shurly and R. G. Turner (*Jour. Amer. Med. Assoc., 94 (1930), No. 8, pp. 539–543, figs. 4*).—Essentially noted from another source (E. S. R., 62, p. 493).

Observations upon carbohydrate metabolism in birds.—I, The relation between the lactic acid content of the brain and the symptoms of opisthotonus in rice-fed pigeons, H. W. Kinnersley and R. A. Peters (*Biochem. Jour., 23 (1929), No. 5, pp. 1126–1136, fig. 1*).—Pigeons in the final stage of polyneuritis showing symptoms of opisthotonus, were found to have an increased amount of lactic acid in the brain as compared with normal pigeons. The technic for the experimental procedure was perfected to the point of making the analysis 15 seconds after death. At this time the normal brain was found to contain 58 mg. of lactic acid and the avitaminous 95 mg. per 100 gm. of tissue. The increase in the lactic acid in the brain tended to follow that in the blood. It is thought to be a necessary accompaniment of the opisthotonus and to disappear within a short time after dosing with torulin.

A localized lactic acidosis in the brains of pigeons suffering from B_1 deficiency, H. W. Kinnersley and R. A. Peters (*Jour. Physiol., 69 (1930), No. 1, pp. XI, XII*).—It is noted briefly that the abnormal amounts of lactic acid found in the brains of vitamin B_1-deficient pigeons (noted above) are unevenly distributed, the increase being especially marked in the lower parts of the brain.

Variations in the mineral composition of the bony tissue of the normal rat, the rachitic rat, and the rat cured of experimental rickets [trans. title], J. Alquier, L. Asselin, M. Kogane, and G. Silvestre de Sacy (*Compt. Rend. Acad. Sci.* [*Paris*], *190 (1930), No. 5, pp. 334–336, figs. 2*).—Data are presented graphically and discussed on the content of total ash, calcium, and phosphorus in 100 gm. of dry bone of rats of six different weight groups on the Randoin-Lecoq rachitic diet (E. S. R., 60, p. 197) and on a normal diet, and in another series similar data for rats receiving as curative treatment for rickets irradiation, irradiated and nonirradiated dried milk, active cod-liver oil, and irradiated ergosterol.

In the normal rats of the first series, although the percentage of phosphorus in the bones remained constant with increasing weight the proportions of total ash and of calcium increased. In the bones of the rachitic rats which had not grown to any extent the values for ash, calcium, and phosphorus were practically normal, but in those which had grown rapidly demineralization was very marked.

In the rats recently cured of rickets, the return to normal of the mineral composition of the bones was not the rule. In those cured by irradiated ergosterol or cod-liver oil remineralization of the bones was rapid, with calcium exceeding normal values, while in those cured by having the rachitic ration irradiated, the figures of ash and phosphorus remained low and those of calcium returned to normal. The addition to the rachitic diet of 5 per cent of irradiated dried milk brought about more extensive remineralization than did cod-liver oil or irradiated ergosterol with the calcium content above normal. Nonirradiated dried milk to the extent of 20 per cent of the diet also cured rickets

The antirachitic value of irradiated wheat, F. F. TISDALL and A. BROWN (*Jour. Amer. Med. Assoc., 94 (1930), No. 12, pp. 854–856, figs. 3*).—Cracked whole wheat and wheat germ irradiated in the laboratory and commercially irradiated muffets were compared with corresponding nonirradiated products for their antirachitic activity by substituting them for corresponding amounts of corn in either the Steenbock or McCollum rickets-producing diet and determining the amount of inorganic phosphorus in the whole blood and the percentage of ash in the bones.

The tabulated results show increases in the percentage ash in the bones of the rats fed the irradiated foods, even when they constituted only from 5 to 10 per cent of the total diet. The results obtained with irradiated muffets were essentially the same as those reported by Steenbock et al. (E. S. R., 62, p. 898). Röntgenograms showed little or no evidence of rachitic processes in rats fed from 15 to 33 per cent of the irradiated foods.

The blood phosphorus figures of those fed the McCollum basal diet with from 25 to 33 per cent of irradiated muffets averaged 2.2 mg. per 100 cc. of blood, whereas in the earlier studies of the authors (E. S. R., 60, p. 694), a daily 2-hour exposure of rats on the McCollum rachitic diet to midday sunshine in the summer months resulted in an average blood phosphorus of 4.7 mg. per 100 cc. The percentages of ash in the bones in the two series were almost the same, 49.2 in the earlier and 50.4 per cent in the present series.

It was discovered that in the present series yellow corn meal had inadvertently been used in place of whole yellow corn in the preparation of the diet. "While this does not interfere in the slightest with the validity of the results from the standpoint of the effectiveness of irradiated foods in promoting the deposition of calcium salts in bones, it does raise the question as to whether there is not some factor other than vitamin D which influences the level of the blood phosphorus. Whether this factor is another vitamin or a disturbance of the inorganic balance in the diet or the effect of the infra-red rays of sunshine remains to be seen."

The question of the practical value of the irradiation of cereals is brought up and answered as follows: "Irradiation of cereals can change them from rickets-producing foods to rickets-preventing foods, and in this lies the value of irradiation as now carried out. As three teaspoonfuls of cod-liver oil each day during the winter months does not furnish any great excess of vitamin D over the amount necessary to prevent rickets in the average infant or young child, any means that can remove the rickets-producing tendency of cereals is of value."

A study of the antirachitic value of irradiated yeast, S. K. KON and M. MAYZNER (*Lancet [London], 1930, I, No. 15, pp. 794–796*).—This demonstration of the antirachitic potency of irradiated yeast was conducted in an orphan asylum in Warsaw where 12 rachitic children from 4 months to 2.5 years of age served as subjects. Six of them received 0.75 gm. daily of freshly irradiated baker's yeast, 3 the same amount of nonirradiated yeast, and the remaining 3 the institutional diet with no additions. The yeast, which was given in suspension in milk, was well tolerated and caused no gastrointestinal disorders.

In the children receiving irradiated yeast, the serum phosphorus increased markedly within 10 days and the serum calcium remained within normal limits. The first clinical sign of improvement was calcification of the cranial bones, the craniotabes disappearing in the course of from 2 to 4 weeks. X-ray examinations showed advanced healing in the course of a month, and after this length of time there was no difference in the behavior and activity of the two groups of children. No temporary growth stimulation such as reported by Hess (E. S. R., 57, p. 792) was observed.

In view of the potency of irradiated yeast, the authors doubt the wisdom or advisability of its indiscriminate use by the general public. It is thought that antirachitic medication and prophylaxis should be left in the hands of physicians.

Sunlight Type S–1 lamp (G. E.) therapy in human rickets and rachitic spasmophilia, H. J. Gerstenberger and G. R. Russell (*Jour. Amer. Med. Assoc., 94 (1930), No. 14, pp. 1049, 1050, figs. 5*).—Observations made on three rachitic infants showed that weekly erythema-producing exposures of both front and back body surfaces to the rays produced by a new commercial lamp for ultra-violet irradiation brought about healing within the time established by Gerstenberger and Hartman previously for similar weekly exposures to a quartz lamp (E. S. R., 61, p. 896). The new lamp is described as a combination incandescent tungsten mercury arc, housed in a glass bulb which is permeable to ultra-violet rays of a wave length of 2,800 a. u.

The effect of ultra-violet light treatment on young children, E. Cassie and U. Cox (*Lancet [London], 1930, I, No. 16, pp. 878–880*).—This discussion is based upon 346 records selected from 1,375 children attending a child welfare light clinic in Birmingham, England, during 1928. The selection was based on regular attendance at the clinic, weight records at the beginning and end of the treatment, and no intercurrent event such as illness, hospital treatment, or country holiday. The conditions under which the children were admitted to the clinic were various, but in all cases the most obvious condition was a failure to gain in weight. The weight records grouped by ages showed for each of the four age groups up to five years a higher average gain than the normal expectation, the most marked gains being in the lowest age group. Further analysis showed gains above average in 54 per cent of all the children, below the average in 24, and at the average in 21. The fact that none of the children receiving light treatment lost weight is thought to indicate that the dosage was not excessive.

Improvement in general health was noted in 83 per cent of the children. Among the rickets cases the improvement was considered better than with cod-liver oil treatment in the home, particularly with respect to nervous symptoms. The possibility is suggested that ultra-violet treatment brings about a more effective elimination of fatigue toxins.

TEXTILES AND CLOTHING

A comparison of some methods of testing the breaking strength of single cotton fibres, H. Navkal and K. R. Sen (*Indian Cent. Cotton Com. [Bombay], Technol. Bul., Ser. B, No. 5 (1930), pp. 10, figs. 3*).—The present paper deals with the merits and demerits of three types of instruments, viz, the hydrostatic (O'Neill's), the balance (Barratt's), and the pendulum (Ball's magazine hair tester), which are used for the determination of the breaking strengths of single cotton fibers. It was concluded that the value obtained by the Barratt tester is much higher than that gained by the other two, both of which seemed to agree fairly well if many readings are taken and if calcium chloride solution replaces water in the O'Neill tester. The magazine tester has the advantage in speed of working and the O'Neill tester in economy of first cost.

The influence of Texas sunlight on the durability and color of cotton fabrics (*Texas Sta. Rpt. 1929, p. 91*).—Included among the fabrics being tested are white and five colors of cotton fabrics of various weaves. Thus far each of the 57 fabrics has been exposed to direct sunlight for a total of 300 hours. At the end of every 25 hours' exposure specimens have been removed for determination of changes in durability and color. In one of the colored fabrics there was a loss in color of 26 per cent after 25 hours, 41 after 50 hours, 48 after 75 hours, and 52 per cent after 100 hours.

An annotated list of literature references on garment sizes and body measurements, R. O'Brien (*U. S. Dept. Agr., Misc. Pub. 78* (*1930*), *pp. 48*).—This annotated bibliography, of interest chiefly to research workers and trade groups, has been assembled primarily to emphasize the dearth of information on and the need of scientifically accurate body measurements of large groups of American men, women, and children as a basis for standardized sizes for garments and patterns. The introduction emphasizes this need through pointing out traditional practices concerning relative proportions of different parts of the body and the uselessness for garment construction of the great mass of physical measurements reported in the literature. The 400 or more references which follow are classified under the headings systems of body proportions developed by artists; anthropometry—its scope, methods, and instruments; measurements of children; measurements of adults; and need for a scientific basis for garment and pattern sizes.

HOME MANAGEMENT AND EQUIPMENT

American housing as affected by social and economic conditions, E. L. Allen (*Peoria, Ill.: Manual Arts Press, 1930, pp. 216, pl. 1, figs. 70*).—This volume describes "the changes that have taken place in types, organization, plan, and equipment of American housing, with explanations of how these changes have been caused by inventions, scientific discoveries, educational progress, financial conditions, political situations, immigration, and other leading developments."

[Experimental kitchen and laboratory at the New Mexico Station] (*New Mexico Sta. Rpt. 1929, pp. 46–49, figs. 2*).—A description, with illustrations and itemized list of equipment, is given of the combination experimental kitchen and chemistry laboratory which has been equipped at the station for a study of the losses incurred in cooking and the factors affecting the palatability of the New Mexico pinto, bayo, and other varieties of beans.

Observations on the possibility of methyl chloride poisoning by ingestion with food and water, W. P. Yant, H. W. Shoaf, and J. Chornyak (*Pub. Health Rpts.* [*U. S.*], *45* (*1930*), *No. 19, pp. 1057–1065, figs. 2*).—Dogs fed food and water saturated with methyl chloride showed no visible symptoms of poisoning, although the kidneys of animals drinking methyl chloride-contaminated water for 115 days in a total period of 171 showed on autopsy a moderate degree of intracellular fatty degeneration. These results show little danger in contamination of foods in an electric refrigerator from such traces of methyl chloride as might be absorbed in the presence of slight leakage in the coils containing the circulating liquid.

Hygiene of the towel, H. D. PEASE and L. C. HIMEBAUGH (*Amer. Jour. Pub. Health, 20 (1930), No. 8, pp. 820-832, figs. 4*).—Bacteriological studies of Turkish, huck, and paper towels after they had been used to wipe hands which had been inoculated with a bright yellow chromogenic bacillus, *Flavobacterium lutescens*, and then thoroughly washed with soap and dried showed that the bacteria were transferred from the hands to the towel in surprisingly large numbers and were also readily transferred from one person to another through the use of the same towel. When the same towel was used repeatedly by the same person the organisms were increased to such an extent as to reinfect the hands wiped on it. Towels of the Turkish type were found to remove greater numbers of bacteria and dirt particles from the skin than huck or paper towels.

"The common towel in public or in the home is an ever present menace as a potential carrier of disease-producing organisms which thus may be easily transferred to the hands of each new user. Whether for drying the face, hands, or entire body, the employment of an individual single service towel constitutes a wise precaution against excessive numbers of relatively harmless or of disease-producing contaminations by bacteria already on previously used towels."

MISCELLANEOUS

A report of the Tribune Branch Agricultural Experiment Station, T. B. STINSON and H. H. LAUDE (*Kansas Sta. Bul. 250 (1930), pp. 36, figs. 16*).—The agriculture of the region is briefly described, and data are summarized regarding the climatic conditions. The experimental work with field crops is for the most part abstracted on page 433.

The Forty-second Annual Report of the Maryland Agricultural Experiment Station, [1929], H. J. PATTERSON (*Maryland Sta. Rpt. 1929, pp. XXIV+465+[2], figs. 109*).—This contains the organization list, a report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1929, and reprints of Bulletins 299-310, all of which have been previously noted.

Fortieth Annual Report [of New Mexico Station, 1929], F. GARCIA (*New Mexico Sta. Rpt. 1929, pp. 73, figs. 4*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the year ended June 30, 1929. The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-second Annual Report [of Texas Station], 1929, A. B. CONNER (*Texas Sta. Rpt. 1929, pp. 164, figs. 2*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1929, and for the various State funds for the fiscal year ended August 31, 1929. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

NOTES

Nevada Station.—A small greenhouse, about 16 by 25 ft., adjoining the university greenhouse, is being built for soils work in the station at a cost of approximately $1,500. The equipment of the soils laboratory, begun about two years ago, is also increasing.

The department has become interested in a problem which may be termed one of "fertilizer placement" in soils. Work on this problem has as its objectives the more accurate determination of the local regions or depths of soils actually reached by applied fertilizing elements, or the lack of penetration of such fertilizing elements into the whole feeding region of the crops' roots due to "chemical stoppage" such as "base exchange" and "reversion." The development of fertilizing materials of such chemical nature that they will not be subject to this chemical stoppage but will be capable of penetrating below the plow line and into a larger portion of the plants' feeding region is also hoped for.

Rhode Island College.—The degree of Litt. D. was conferred by the college at its recent commencement on William John Cooper, United States Commissioner of Education.

Texas Station.—According to a note in *Science*, J. N. Roney has been appointed entomologist of the plant lice laboratory at Dickinson; S. E. Jones, station entomologist vice C. J. Todd, resigned to engage in farming; and J. P. Smith, associate professor of agricultural engineering in the college, chief of the division of agricultural engineering.

Mexican Commission on Agricultural Education.—A commission of three members, consisting of Dean and Director H. W. Mumford of the Illinois University and Station, Director Fabian Garcia of the New Mexico Station, and J. W. Gilmore, agronomist of the California University and Station, has been appointed by the Mexican Government to study the agricultural schools and educational conditions of Mexico and to advise with that Goverment regarding their development. Among its other duties this commission was expected to spend a part of the past summer in Mexico, visiting the National Agricultural College near Mexico City and other institutions and giving a series of lectures to the students on the work of the agricultural colleges and similar institutions in this country.

Greens-keeping Research Station in Yorkshire.—The British golf unions have recently opened at Bingley, Yorkshire, the St. Ives Research Station for the scientific study of greens-keeping problems. A wide range of soils and altitude is available on the estate which is to be utilized, and about 400 plats are to be laid out for a study of manurial and cultural conditions most suitable for putting greens, comparative tests of seed mixtures, and vegetative propagation trials of *Agrostis canina* and other stolon-forming grasses. It is hoped later to extend the studies to problems of turf culture peculiar to other sports.

Central Agricultural Experiment Station, Cuba.—According to a note in *Tobacco*, this station, located at Santiago de las Vegas, has recently been rebuilt and its personnel enlarged. About $65,000 was expended for building operations in 1929.

Sun Yat-Sen Memorial Park.—The Sun Yat-Sen Tomb and Memorial Park Commission of Nanking, China, has acquired a tract of approximately 10,000 acres, comprising the entire Purple Mountain and its surrounding villages, and is developing this area as a memorial park. A large part of it will be used for the planting of various forest trees, but a considerable section is reserved for fruit and vegetable experimental gardens.

New Journals.—*Archiv für Mikrobiologie*, a journal published in the interests of investigations in microbiology, is being issued from time to time at Berlin by an international committee, with Drs. S. A. Waksman of the New Jersey Experiment Stations and E. B. Fred of the Wisconsin Experiment Station as the representatives from the United States and with J. Behrens and A. Rippel as editors. The initial number contains the following contributions: *Mycococcus cytophagus* n. sp. 1929 (*Spirochaeta cytophaga* Hutchison and Clayton 1919), by R. Bokor (pp. 1–34); The Effect of Bile Salts on Several Fermentation Organisms, by F. Boas and G. Neumüller (pp. 35–59); The Tannin-Restoring Microorganisms, by A. Rippel and J. Keseling (pp. 60–77); Heat Formation in Pure Cultures and the Cause of the Self-Heating of Plant Materials, by H. Miehe (pp. 78–118); Quantitative Investigations on the Effect of Carbonic Acid on Heterotrophs, by A. Rippel and F. Heilmann (pp. 119–136); and Observations on the Mechanism of Serum Agglutination in Bacteria, by P. Lasseur and A. Dupaix (pp. 137–164).

The Journal of the Royal Army Veterinary Corps is being published quarterly at the Royal Army Veterinary School, Thornhill, Aldershot, England. The initial number contains several scientific articles, among them The Treatment of Surra (Trypanosomiasis) of Equines in India by Intravenous-Intrathecal Injections of Bayer 205, by A. J. Williams (pp. 37–42), and A Case of Phosphorus Poisoning in Sheep, by W. L. Stewart and B. Thomas (pp. 44–47).

Anales de la Escuela de Veterinaria del Uruguay is being published monthly by the Veterinary School of Montevideo, Uruguay. The initial number contains a description of the school and its work; original articles entitled Contribution to the Study of Basedow's Syndrome, by A. Delgado Correa (pp. 23–33), A Fistula of the Bovine Stomach, by E. G. Vogelsang (pp. 34–36), and Sarcoma of the Uterus, by Mr. Carballo Pou (pp. 37–40), and various administrative decrees.

Irrigación en México is being published monthly at Mexico City by the National Irrigation Commission. Its material is divided into sections of editorials; studies, construction, and colonization; education and publicity; notices; and foreign articles. The initial number contains data as to a number of existing irrigation projects.

The American Rose Quarterly is being published by the American Rose Society at West Grove, Pa. It is hoped thereby to supplement the American Rose Annual by more frequent publication of announcements and other timely material. The initial number contains among other information suggestions for holding a rose show.

Miscellaneous.—According to a note in *Science* Dr. E. B. Abbott, plant pathologist, and Ralph H. Gray, horticulturist, of the Agricultural Experiment Station at Lima, Peru, have resigned, the former to accept an appointment with the U. S. D. A. Bureau of Plant Industry and the latter to enter commercial work.

A. M. Shaw has been appointed dean of agriculture in the University of Saskatchewan vice Dean William J. Rutherford, deceased.

EXPERIMENT STATION RECORD

Vol. 63 October Abstract Number No. 6

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Sulfur in proteins.—IV, The effect of alkalies upon cystine, R. A. Gortner and W. B. Sinclair (*Jour. Biol. Chem., 83 (1929), No. 3, pp. 681–696*).—The present paper continues the record of a comparative study, reported in part in the third number (E. S. R., 58, p. 10) of this series from the Minnesota Experiment Station, of the properties of levorotatory cystine with those of an optically inactive cystine, prepared in the previous investigation cited by boiling the ordinary form of the amino acid with 20 per cent of hydrochloric acid.

With respect to the action of various alkaline solutions upon cystine, the findings of the investigation here noted were in part the following:

"Comparative studies of *l*-cystine and *i*-cystine boiled with alkaline solutions show that these two forms are characterized by the same rate of decomposition and the same extent of decomposition. Boiling cystine with a 1 per cent solution of sodium carbonate causes very appreciable decomposition of the cystine molecule, the extent of decomposition increasing with time until at the end of 24 hours approximately half of the cystine has been decomposed. Increasing the strength of the sodium carbonate solution to 5 per cent does not greatly increase the rate or extent of deamination or, apparently, of cystine destruction, although appreciably larger quantities of the cystine sulfur are converted into sulfide sulfur. Boiling cystine with a 6.5 per cent solution of $Ba(OH)_2 \cdot 8H_2O$ produces rapid deamination and loss of sulfur from the cystine molecule. Approximately 50 per cent of the cystine is destroyed in the first hour of boiling, the nitrogen being liberated as ammonia and the sulfur largely as sulfide sulfur. However, at the end of 24 hours of boiling there still remains approximately 15 per cent of organically bound amino nitrogen and an equivalent amount of organically bound sulfur. Sodium hydroxide and potassium hydroxide solutions in 20 per cent concentration causes relatively slight deamination; after 24 hours of boiling approximately 83 per cent of the original nitrogen is still present as α-amino nitrogen. There is some evidence that these solutions of strong alkalis cause rapid and complete removal of the sulfur from the cystine molecule. A 6 per cent solution of strontium hydroxide and a 5 per cent suspension of calcium hydroxide bring about rapid deamination of cystine, the deamination produced by boiling cystine with a 5 per cent suspension of calcium hydroxide reaching 92 per cent during 12 hours of boiling.

"The rate and extent of deamination does not appear to be a function of the hydroxyl ion concentration of the alkaline solution. There appears to be an intimate relationship between the deamination mechanism and the rate at which sulfur is removed from the cystine molecule. It is suggested that deamination of cystine in alkaline solution may be associated with an oxidation-reduction mechanism, and that when all, or nearly all, of the sulfur has been removed from the cystine molecule, then the α-amino groups which still remain become relatively stable. . . .

"Cystine or some organic compound having essentially the same nitrogen : sulfur ratio as cystine still persists in the solution after 24 hours of boiling of cystine with 6.5 per cent barium hydroxide. It is suggested that this 'compound' may be another 'isomeric' form of cystine, differentiated from cystine by the fact that it is extremely soluble in water, so soluble in fact as to be hygroscopic."

Aromatic aldehyde derivatives of proteins, peptides, and amino acids, H. D. Dakin (*Jour. Biol. Chem., 84 (1929), No. 2, pp. 675–682*).—Benzaldehyde derivatives of gelatin, casein, zein, glycylglycine, glycylleucine, alanylleucine, leucinimide, and alanine are described, as are also compounds of the proteins named with chlorobenzaldehyde. A number of the chemical properties and reactions of derivatives of the type indicated are reported and briefly discussed.

The separation of cystine from histidine: The basic amino acids of human hair, H. B. Vickery and C. S. Leavenworth (*Jour. Biol. Chem., 83 (1929), No. 3, pp. 523–534*).—A contribution from the Connecticut State Experiment Station, this report notes the discovery of a silver compound of cystine precipitable at pH values even below 3.0 and still less soluble at higher pH values, so that "at pH 6.0 nearly all the cystine . . . is precipitated. Since this amino acid is largely precipitated by the other heavy metal reagents customarily employed to throw down histidine, it inevitably finds its way into histidine fractions secured by the usual methods of protein analysis."

A means of obviating this difficulty was found, however, in the observation that "cystine copper is very insoluble and separates readily and completely when a solution of cystine is boiled with an excess of copper hydroxide and cooled. Under the same circumstances histidine remains in solution. Histidine fractions can therefore be freed from cystine by proper treatment with copper hydroxide, and this manipulation contributes materially to the ease and accuracy with which histidine can subsequently be determined as dinitronaphtholsulfonate in such fractions," by modifications of the method previously contributed from the same station (E. S. R., 60, p. 414).

The paper contains also an account of the determination in human hair of 0.5 per cent of histidine, 8.0 per cent of arginine, and 2.5 per cent of lysine, in the presence of cystine amounting, according to a colorimetric determination, to 16.5 per cent.

The basic amino acids of wool, H. B. Vickery and R. J. Block (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 107–111*).—An investigation of the Connecticut State Experiment Station, the work here reported included the isolation from the protein of sheep wool by means of the silver precipitation method, previously contributed from the same station (E. S. R., 60, p. 414), of basic amino acids, including 0.66 per cent of histidine, 7.8 per cent of arginine, and 2.3 per cent of lysine.

"The keratin of the hair of this species . . . is closely comparable to that of human hair [noted above] with respect to the yields of these three bases."

Note on the preparation of the monoamino acids from their picrates, G. J. Cox and H. King (*Jour. Biol. Chem., 84 (1929), No. 2, pp. 533, 534*).—The authors of this contribution from the University of Illinois "found that aniline, being a stronger base than the monoamino acids, will decompose their picrates, and, if an excess is used, it will dissolve the aniline picrate formed and make possible its removal from the aqueous solution of the amino acid."

By this method were readily obtained larger yields both of proline and of glycine than could be had by decomposing the picrates with sulfuric acid, extracting the picrate acid with benzene, removing quantitatively the sulfate ion with barium hydroxide, filtrating and washing the barium sulfate, and evaporating the filtrate and washings. Detailed procedures for the cases both of proline and of glycine.

Carotene.—I, The oxygen equivalent determined with potassium permanganate in pyridine solution, J. H. C. Smith and H. A. Spoehr (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 87–92*).—From a series of titrations of the unused permanganate present in oxidations in pyridine solution, and from an interpolation of the data to a maximum value of the oxygen equivalent, the authors first determined the known oxygen equivalent of cinnamic acid (5.00), obtaining the value 4.97, and then applied the method to the determination of the oxygen equivalent of a preparation of carotin extracted from carrots and found to melt at 172° C. (uncorrected). The value 41.97, confirming a previously reported figure, 42, was obtained.

With respect to the necessity for the mathematical analysis used, it is noted that "the permanganate concentration is always larger in the control, at any given time, than in the reaction tubes, and as a consequence more will be used in the oxidation of the solvent in the control than in the reaction tubes. In order to find the maximum value for the oxygen equivalent from the data observed, it will be necessary to interpolate to the maximum."

The isoelectric point of gelatin and its relation to the minimum physical properties of gelatin, J. M. Johlin (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 231–243, figs. 3*).—Implying the effects of neutral salts upon certain of the properties of gelatin as a means of locating the isoelectric point or points of the protein, the author found upwards of two isoelectric points, the one at pH 4.68, the other at pH 5.26.

He states in part that "it has shown that all of the minimum physical properties of gelatin are therefore properties of pure gelatin and not of isoelectric gelatin, and that pure gelatin has a pH of approximately 4.95. Any inconsistency between these facts and the requirements of the law of ionic equilibria is explained on the basis of the existence of associated gelatin molecules between a pH of 4.68 and 5.26, the apparent isoelectric points of gelatin. No immediate explanation can be given for what appears to be an isoelectric point at pH 5.26. If this is not an actual isoelectric point, then the derivation of the isolectric point from the effect of neutral salts on proteins is held to be no longer tenable."

A study of glutathione.—I, Its preparation in crystalline form and its identification, E. C. Kendall, B. F. McKenzie, and H. L. Mason (*Jour. Biol. Chem., 84 (1929), No. 2, pp. 657–674, fig. 1*).—Opening a series of contributions projected by the Mayo Foundation, the paper noted presents the following as modifications of the Hopkins method for the isolation of glutathione:

"The suspension of yeast is extracted with cold water in the presence of benzene. The cells are removed in a large centrifuge. The solution is precipitated with neutral lead acetate. The pH of the solution must be about 5.5. The lead precipitate is decomposed with sulfuric acid, and some impurities are removed by raising the pH to 4.0 with barium hydroxide. The solution is made acid and is treated with phosphotungstic acid at 0°. The phosphotungstic acid is removed with barium, and the glutathione is precipitated with mercury sulfate. The mercury precipitate is decomposed with hydrogen sulfide. Sulfuric acid is removed from the solution, which is then concentrated to a small volume. On standing, the solution sets to a crystal mass and the crystals are washed with glacial acetic acid and absolute alcohol. They may be recrystallized from water."

This material was found to be "a tripeptide of glutamic acid, glycine, and cysteine. The glycine is attached to the carboxyl group of glutamic acid, which is nearest to the amine group. Cysteine is attached to the other carboxyl group of the glutamic acid. . . . The material precipitated from the mother liquor of the crystals with absolute alcohol has very nearly the same percentage composition, and glycine can be separated after hydrolysis from this material and from the crystalline tripeptide in about the same yield. It seems highly probable that practically all of the cysteine is present in the form of the tripeptide."

Interfacial adsorption as a function of the concentration of colloidal solutions, J. M. Johlin (*Jour. Biol. Chem., 84 (1929), No. 2, pp. 543–551, figs. 2*).—It was the author's object "to show that the equilibrium values which are obtained by means of the sessile bubble method of measuring surface tension, when a substance like sodium oleate is concentrated at a solution-air interface, are dependent upon the solution concentration. It has heretofore been generally thought that this surface concentration proceeds so as to give surface tension values which are constant, irrespective of the concentration of the solutions, and that the process of adsorption is an irreversible one."

Sodium oleate was studied in concentrations of from 0.164 to 0.0000003 N. In the highest dilutions the surface tension was found a linear function of the logarithm of the concentration. With increasing concentration the relative surface tension was found to fall off gradually "until a surface tension minimum is reached at a concentration of 0.0019 N, when surface tension values rise again with increasing concentration until a concentration of 0.059 N is reached. At still higher concentrations the surface tension remains constant up to a concentration of 0.164 N. The values obtained by this method are not absolute. As relative values they nevertheless indicate that there is not an entire want of reversibility between the sodium oleate adsorbed at the interface and the main bulk of the solution."

The determination of exchangeable bases in soils: Magnesium, potassium, and total bases, R. Williams (*Jour. Agr. Sci. [England], 19 (1929), No. 4, pp. 589–599*).—Exchangeable magnesium and potassium were found in the investigation here reported from the University College of North Wales to be determinable, in soils free from carbonates, by the use of 0.5 N acetic acid as a leaching agent. A procedure for the estimation of the total exchangeable bases present as acetates in the leachings is given in the working outline essentially as follows:

Leach 25 gm. of the soil with 0.5 N acetic acid, collect 1 liter of the leachings, and evaporate to dryness 500 cc. of this solution. After the evaporation, place the dish in a steam oven for a short time to insure thorough drying before ignition and to avoid a possible spitting during the latter stage. Then heat at a dull red for about 5 minutes. Cool, add 20 cc. of 0.2 N hydrochloric acid, rubbing the solid matter thoroughly in the acid with a rubber tipped glass rod. Cover the dish and let the mixture stand overnight. Pour the contents of the dish into a small filter paper, wash well with boiled distilled water, and determine the excess of acid by titration with standard carbonate-free sodium hydroxide, phenolphthalein as indicator. Although "some error might be apprehended from the presence of carbon dioxide from the reaction of the 0.2 N hydrochloric acid with carbonates in the residue," it was found in actual practice that "the agreement shown . . . indicates that the method used is applicable for routine purposes." However, "for specially accurate work it would be preferable to include a short boiling before titration."

"The results obtained by this method differ from those obtained by summation of separate determinations by an amount equivalent to the sulfates and chlorides present. It is suggested that the total exchangeable bases by the proposed method gives a truer measure of the exchangeable bases than methods in which bases present as sulfates and chlorides are also reckoned in."

Determining soil organic matter by means of hydrogen peroxide and chromic acid, W. T. Degtjareff (*Soil Sci., 29 (1930), No. 3, pp. 239–245*).—The author presents as a contribution from the Siberian Institute of Agriculture and Forestry at Omsk a method developed essentially as a modification and refinement of that of Schollenberger (E. S. R., 58, p. 113) and consisting of the following procedure:

"From 0.2 to 0.15 gm. of air-dried soil, finely crushed and carefully run through a 0.25-mm. sieve, is put into an oval-bottomed, long-necked, 100-cc. vessel. Over this is poured a solution of 10 or 15 cc. of hydrogen peroxide; then 10 or 15 cc. of chromic acid solution is added (on the sides of the vessel). The compound is shaken by hand for 1 minute with vigorous circular movements. Considerable heat is generated, and a complete oxidation of soil organic matter takes place. The contents of the vessel are washed into a beaker, diluted with water to 200 cc., and the residue of chromic acid is titrated against ferrous solution in the presence of diphenylamin. A blank is thus obtained, and the difference between the amount of ferrous solution used for the titration of the blank and that for the soil sample is a measure of the amount of carbon in the soil organic matter. To find the logarithm of the carbon content in a given weight of soil, we must add to the logarithm of the 'carbon figure' (i. e. of the quantity of carbon which corresponds to 1 cc. of ferrous solution) a logarithm of the difference in cubic centimeters of ferrous solution. The amount of carbon determined may be expressed as a percentage of the soil weight. Only 10 minutes is required for the entire determination."

Method for the determination of inorganic nitrogen in dried plant tissue, A. C. Sessions (*Soil Sci., 29 (1930), No. 4, pp. 285–289, fig. 1*).—The method described is a contribution from the New Jersey Experiment Stations and is carried out essentially as follows:

Dry the material immediately after harvesting at a temperature of 95° C., grind the dried tissue to pass through a 30-mesh sieve, place the sample of from 2 to 5 gm. in an aspirating flask of a capacity of 300 cc. with 70 cc. of water, agitating the mixture carefully at intervals for about an hour, and washing down adhering material after each shaking with the use of a total of not more than 30 cc. of water. Connect each flask with a 2.5 by 25 cm. test tube containing standard acid to absorb the ammonia evolved, and place in each flask 15 gm. sodium chloride and from 3 to 4 gm. of 100-mesh powder of Devarda's alloy, together with sodium hydroxide sufficient to make the contents of the flask about one-seventh normal. Connect 12 of the flask absorption tube units in series, guard the air entrance end of the system with an ammonia trap in which the entering air bubbles through sulfuric acid, and connect the exit end through a Bunson valve in an empty trap flask to a water aspirator. After the completion of the reaction and absorption, titrate the excess standard acid in each absorption tube and calculate as the nitrate nitrogen of the sample the ammonia nitrogen found.

The adaptation of the Benedict-Denis method to the determination of sulfur in plants, D. E. FREAR (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 285–289*).—The Rhode Island Experiment Station has shown the Benedict-Denis reagent capable of the satisfactory oxidation, without pretreatment of the material, of the sulfur content of plant tissue representative of a wide range of crop composition, results "in close agreement with the values obtained by the official sodium peroxide fusion method" having been demonstrated.

"The use of any preliminary treatment of the sample is avoided in this procedure, thereby shortening the time necessary for the determination as well as introducing a much simpler technic."

An electrolytic method for the determination of small amounts of mercury in body fluids and tissues, A. G. YOUNG and F. H. L. TAYLOR (*Jour. Biol. Chem., 84 (1929), No. 1, pp. 377–391, figs. 4*).—This paper presents (1) a method providing "a fairly rapid and accurate way of determining mercury in physiological fluids," and (2) experimental findings in part as follows:

"Hydrolytic oxy compounds of mercury are not formed in the presence of sulfuric acid. Reduction of the mercury to the low valence form increases its loss in open digestion. Mercury is not precipitated completely on copper, even after digestion and prolonged standing. . . .

"The upper limit of accuracy [of the method] is within 1 per cent of the true value, which compares favorably with other biological methods. The method has been used for 400 determinations on physiological fluids without complications, and by these determinations it has been possible to make complete studies of the excretion and distribution of mercury on patients and animals. The combination of the electrolytic with a titration method obviates many of the difficulties encountered with other mehods, owing to the presence of interfering agents, and the necessity of expensive apparatus."

A colorimetric method for the quantitative determination of nitrates and nitrites in biologic fluids, M. WHELAN (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 189–197, fig. 1*).—A method dependent upon the formation of a blue color by the reaction either of nitrates or of nitrites with diphenylbenzidine in acid solution is here described in a contribution from the Mayo Foundation. The method "has been applied to blood, urine, ascitic fluid, pleural fluid, edema fluid, and saliva, with an average error of ±2 per cent."

A modified Van Slyke amino nitrogen apparatus, F. C. KOCH (*Jour. Biol. Chem., 84 (1929), No. 2, pp. 601–603, fig. 1*).—The author describes and illustrates a form of the Van Slyke apparatus for the determination of amino nitrogen (E. S. R., 26, p. 22), in which a special form of Ostwald pipette replaces the usual sample-measuring burette and carries a type of stopcock considered less liable to leakage than is the standard form. At the same time the tube from the reagent reservoir is made to enter the reaction vessel at an upward slant, the downward slant of the usual form of the apparatus at this point having been found capable of trapping a part of the gas evolved.

Slight differences in manipulation are also described.

Reducing powers of different sugars for the ferricyanide reagent used in the gasometric sugar method, J. A. HAWKINS (*Jour. Biol. Chem., 84 (1929), No. 1, pp. 79–82*).—Glucose equivalents in the reduction of potassium ferricyanide solutions were determined for mannose, galactose, fructose, arabinose, xylose, maltose, and lactose and are here tabulated.

A new method for estimating the true fat content of buttermilk, W. E. PETERSEN and E. O. HERREID (*Minnesota Sta. Tech. Bul. 63 (1929), pp. 16*).—The Garrett-Overman method and reagent (E. S. R., 60, p. 313) for use in Babcock fat determinations was found to give clear fat columns that could be read easily, and to give good checks, unaffected by the addition of lecithin to the buttermilk samples examined; but the trisodium phosphate of the reagent crystallized on cooling, so that the reagent had to be heated before use, the presence of ammonia made the reagent "objectionable to handle," and it was found to deteriorate on standing.

A modified alkaline reagent for the Babcock test was made from 110 gm. of sodium carbonate and 200 gm. of sodium salicylate dissolved in water and made up to 1 liter, completed by the addition of 30 cc. of 50 per cent sodium hydroxide and 100 cc. of normal butyl alcohol. A procedure in which this reagent proved very satisfactory for buttermilk and gave promise of a possible applicability to other dairy products is thus described:

"Nine gm. of buttermilk are placed in a skim milk test bottle. Ten cc. of the Minnesota reagent is added and the contents of the bottle are well mixed. The test bottles are placed in a water bath at 71 to 82° C. for 6 to 7 minutes and shaken several times during this interval. The bottles are centrifuged for 5 minutes at a speed of 800 revolutions per minute in an 18-in. centrifuge. Warm water is added to the base of the neck of the test bottles and they are centrifuged for 2 minutes. Sufficient warm water is added to bring the fat into the graduated neck of the test bottles and the centrifuge is operated for another minute. The test bottles are placed in a water bath at 57 to 60° for 5 minutes and the fat reading taken is multiplied by 2 because a 9-gm. sample of buttermilk is used. This method gave excellent results. The contents of the test bottle after completing a buttermilk fat determination were only slightly opaque, indicating that the solids-not-fat were highly dispersed in the alkaline solution."

Utilization of onions by canning (*Massachusetts Sta. Bul. 260 (1930), pp. 358, 363, 364*).—Further progress by C. R. Fellers on this project (E. S. R., 61, p. 889) has shown that a short blanching, from 1.5 to 3 minutes, in boiling water loosens the outside skin of the onions and greatly facilitates its removal. The use of zinc-enameled tin cans has again proved effective in preventing a black or smut formation, probably through the fact that the compound formed from the liberated sulfur of the onions with the zinc is white and therefore not objectionable.

In tinned onions the film on the side of the container was found by C. P. Jones to consist of tin sulfide. Black deposits in the head space of certain enameled tins were found to contain both zinc and iron, the latter in such amount as to indicate "other forms besides the sulfide, presumably oxides." In the general case of a blackening of tins by commercially processed fruits and vegetables the preliminary experiments "indicated that sulfur from the protein molecule caused the discoloration. Experiments conducted with cysteine hydrochloride further confirmed this view. In the case of the onion, other sulfur compounds are present in addition to those associated with the protein molecule, and were therefore considered as possible discoloring factors. . . . Several oils (technical alkyl sulfide and disulfide, allyl sulfide, and mustard oil) were investigated as to the probability of such sulfur compounds constituting discoloring agents. This was found not to be the case, with the exception of mustard oil. The presence of mustard oil would result, through decomposition, in the discoloration of the can to some degree."

In an investigation of the discoloration of the onion itself the onion bulb was shown to contain a flavonol pigment, probably quercetin, and the liquor from the tins, plain or enameled, contained ferrous iron. Dissolved iron in the ferrous state was found not to produce any colored compound, but ferric iron caused a coloration similar to that appearing on exposure of tinned onions to the air, leading to the conclusion that probably the ferrous iron, present in the liquor as a result of an attack upon the wall of the can, "when exposed to the atmosphere oxidizes and forms an olive-green ferric derivative of flavonol."

SOILS—FERTILIZERS

[Soil Survey Reports, 1925 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1925, Nos. 21, pp. 44, pl. 1, fig. 1, map 1; 22, pp. 32, pls. 2, fig. 1, map 1; 24, pp. 50, pls. 4, fig. 1, map 1; 25, pp. 70, pls. 3, fig. 1, map 1; 27, pp. 55, pls. 2, figs. 2, map 1*).—The five surveys here noted were carried out with the cooperation of the respective State experiment stations.

No. 21, Part 1. *Soil survey of Wayne County, Indiana*, T. M. Bushnell et al. (pp. 1–31).—Wayne County, east-central Indiana, comprises a soil area of 259,200 acres and shows as its main local features glacial uplands, glacial river terraces or outwash plains, and alluvial plains. In general the county is well drained, in part by dredged outlets, ditches, and tile.

Classified soils of 23 types assigned to 18 series, together with muck, peat, and river wash, constitute the material mapped and described. Miami silt loam, Crosby silt loam, and Fox silt loam lead in areal extent with 32.6, 21.9, and 14.5 per cent, respectively, of the total acreage included in the survey.

No. 21, Part 2. *The management of Wayne County soils*, A. T. Wiancko and S. D. Conner (pp. 33–44).—Some data indicative of the chemical composition of a number of the soils noted in part 1 are given, and their management is briefly discussed under the subheads light-colored silt loam upland soils, light-colored terrace soils, dark-colored upland and terrace soils, bottom lands, and muck soils.

No. 22. *Soil survey of Brown County, South Dakota*, W. I. Watkins and G. A. Larson.—Brown County, northeastern South Dakota, contains 1,100,160 acres of lands varying in surface from level to strongly undulating, possessing for the most part good internal and fair surface drainage, and classified into 11 series and 24 types, together with 0.2 per cent of dune sand. Bearden silt loam, Barnes loam, and Barnes silt loam amount, respectively, to 25.5, 20.8, and 11.9 per cent of the area covered by the survey.

No. 24. *Soil survey of Nacogdoches County, Texas*, B. H. Hendrickson et al.—Nacogdoches County consists of 625,920 acres of, for the most part, rolling to hilly timberlands, located in east-central Texas and drained by Angelina River and Attoyac Bayou. The soils found consist of 22.9 per cent of Ruston fine sandy loam, 20.6 per cent of Kirvin fine sandy loam, and 10.4 per cent of Norfolk fine sand, together with other soils of minor extent forming a total of 17 series and 28 types.

No. 25. *Soil survey of Milam County, Texas*, W. T. Carter et al.—Milam County is an area of 654,080 acres in east-central Texas, flat to rolling in surface, and drained by Brazos River. Houston black clay constitutes 11.7 per cent and Catalpa clay 10 per cent of the total area of the county and with clays of other series make a total of 9 clay types among the 30 types, 18 series, found in the county. Rough broken land amounting to 0.3 per cent is also listed.

No. 27, Part 1. *Soil survey of Putnam County, Indiana*, E. D. Fowler and H. R. Adams (pp. 1–41).—Putnam County, west-central Indiana, has an area of 309,120 acres, and has the surface features of an undulating to gently rolling plain, dissected by numerous streams which form an adequate drainage outlet for all parts of the county.

A total of 20 types, representing 18 series, comprises the classified soil areas of the county, the major part of the area being occupied by Fincastle silt loam, Russell silt loam, Cincinnati silt loam, and Gibson silt loam, of which the proportions are given as 26.9, 21.7, 12.9, and 11.3 per cent, respectively. Meadow, muck, and quarries amount together to 3.4 per cent.

No. 27, Part 2. *The management of Putnam County soils*, A. T. Wiancko and S. D. Conner (pp. 43–55).—The chemical composition and the management of Putnam County soils are dealt with as in Wayne County, noted above.

The composite character of the soil profile, its relation to soil classification, C. G. T. Morison (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 4, pp. 677–683*).—"The purpose of this short contribution [from the University of Oxford, England] is to draw attention to the composite character of the soil profiles, and to the importance of considering the interrelation of these, and to emphasize anew the part played by soil climate as distinct from atmospheric climate in soil development."

The revised official British method for mechanical analysis, N. M. Comber et al. (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 4, pp. 734–739*).—Some modifications of definition and of method are noted and briefly discussed.

The capillary pull of an ideal soil, F. E. Hackett and J. S. Strettan (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 4, pp. 671–681, figs. 4*).—In an investigation reported from University College, Dublin, "the capillary pull of an ideal soil has been determined by measuring the maximum hydrostatic pressure (H) sustainable by a liquid surface formed amongst an assemblage of uniform spheres of mean diameter 0.0374 cm. ($2a$). It has been found that using liquids of low surface tension like benzene to avoid contamination, the constant K in the equation $Hg\rho=KT/2a$ has the weighted value 9.5." For single apertures between three and between four steel spheres of a diameter of 0.125 in., K for benzene varied but slowly for four spheres and had a value of from 9 to 10 for apertures of breadth to length ratio ranging from 1.0 to 0.4.

"The equivalent capillary tube is the circular or elliptic cylinder touching the spheres forming the aperture. This assumption gives values of K in fair agreement with observation. The value of K is practically independent of variations of pore space ranging from 36 per cent to 40 per cent, such as usually occur in ordinary packing."

Plastometric studies of soil and clay pastes, B. A. Keen and G. W. S. Blair (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 4, pp. 684–700, figs. 6*).—The authors of this contribution from the Rothamsted Experimental Station consider the laboratory study of the physical properties of soils and clays divisible conveniently into the three stages represented by material having (1) a moisture content comparable to that obtaining in the field, (2) the condition of a thick paste, and (3) such a soil or clay concentration as to form a thin suspension. The plastometric method was applied to material in the second of the stages above mentioned, and in the discussion of this work "recent developments of the theory of the flow for thick pastes under stress are outlined."

Of the results it is stated that "it is shown that certain constants defining the material can be obtained from the experimental data. The two to which special attention is given are the pseudo-viscosity (a quantity analogous to the viscosity of true fluids) and the static rigidity (which represents the energy required just to cause the paste to flow and a measure of the solid cohesive properties of the system). The latter quantity is related to other physical measurements made under very different experimental conditions, e. g., the resistance of the soil to the passage of cultivation implements, the effect of chalk, etc., on the soil resistance, the moisture content at which a well-kneaded mass of soil is about to become sticky."

"Single value" soil properties: A study of the significance of certain soil constants, B. A. Keen and J. R. H. Coutts (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 4, pp. 740–765, figs. 4*).—The numerical characteristics given trial in the investigation reported in this contribution from the Rothamsted Experimental Station were selected (1) for the simplification of the apparatus required for their determination and (2) for definite relation to "some distinct soil characteristic," and were as follows: Percentage of clay, moisture content of soil in equilibrium with air at 50 per cent relative humidity, loss on ignition of a dried soil, moisture content at the "sticky" point, moisture content of the saturated plastic block (a value found closely to approximate the sticky point), and the pore space and true and apparent specific gravities of the oven-dried block.

"The most important feature of the present investigation was the repetition of the above measurements after the soils had been treated with hydrogen peroxide. Considerable experience of the effect of hydrogen peroxide on soil is now available . . ., and our present knowledge indicates that it removes the humified and nonstructural part of the organic matter without exercising more than a small solvent effect on the mineral portion of the soil. It has been assumed in the present investigation that the physical properties of the mineral portion are not appreciably altered by the peroxide. A comparison of the results for the original and peroxide treated soils thus gives an opportunity of comparing the relative contribution of the organic and the mineral portion of the soil to the single value measurements examined."

The general results with some 39 soils are given for each of the constants mentioned. "The importance . . . of introducing single value methods as an adjunct to the modern system of soil classification and into soil physics" is emphasized.

The proteins of different types of peat soils, W. L. Davies (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 4, pp. 682–690*).—A report from the University of Reading, England, the paper noted presents an account of analyses of 10 typical peats in comparison with 2 normal soils. The degree of humification was high in the wet peats and low in the dry phases of this form of soil. Extracts obtained by the use of boiling hydrogen peroxide, of 20 per cent hydrochloric acid, and 2.5 per cent potassium hydroxide were studied.

"Hydrogen peroxide extracted roughly 70–80 per cent of the soil nitrogen, 60–70 per cent of this soluble nitrogen appearing as ammonia through the oxidizing effects of the reagent. The nitrogen compounds of wet peats were more easily oxidizable to ammonia.

"Hydrochloric acid extracted approximately the same amount of nitrogen as hydrogen peroxide. The nitrogen thus extracted was distributed into four fractions, ammonia, humin, monamino acid, and diamino acid nitrogen. Peat proteins were found to yield by acid hydrolysis from three to five times as much amide nitrogen as pure vegetable or animal proteins, part of which might have been derived from the small amount of diamino acids broken up during hydrolysis of proteins with acids in the presence of soluble carbohydrates to form the excessive amount of acid-soluble humin present. From comparison with the values obtained for normal soils, the wider the ratio of monamino acid nitrogen to diamino acid nitrogen, the more efficient could the protein degradation in the soil be considered, whereas the effect of calcium bicarbonate and mobile water in tending to remove the products of degradation also favored the breaking down of protein. Dry peats, on the other hand, showed a narrow ratio.

"Alkali was not so destructive in its hydrolytic action as the acid, but the ratios of monamino acid to diamino acid nitrogen ran parallel to those found for the acid extracts. •

"Protein degradation in peaty soils as measured by the comparative breaking down of diamino acids at a faster rate than the monamino acids was favored by wet calcareous conditions. Wet conditions alone favored degradation slightly more than dry acid conditions. The conditions favorable for a high degree of humification also tended to favor protein degradation."

Biochemistry of waterlogged soils.—Part III, Decomposition of carbohydrates with special reference to formation of organic acids, V. SUBRAHMANYAN (*Jour. Agr. Sci. [England], 19 (1929), No. 4, pp. 627–648, figs. 8*).—Having dealt in the two previously noted contributions (E. S. R., 59, p. 812) with "the more prominent effects of water logging in absence of foreign materials," the author of this series of the Rothamsted Experimental Station deals in the present paper with experiments on the changes attending the addition of nitrates and of carbohydrates.

In the absence of decomposing organic matter, no nitrogen was found to be lost from the nitrates added. The addition of small quantities of such fermentable substance as glucose was followed by a rapid disappearance of nitrates and oxygen, without, however, any evidence of denitrification, and by increases in the acidity, the carbon dioxide, and the numbers of bacteria. "The greater part of the soluble nitrogen was assimilated by microorganisms or otherwise converted, and the greater part of the added carbohydrate was transformed into lactic, acetic, and butyric acids.

"The organic acids were formed from a variety of carbohydrates. Lactic acid was the first to be observed and appeared to be formed mainly by direct splitting of the sugar. It decomposed readily, forming acetic and butyric acids. Some acetic acid was formed by direct oxidation of lactic acid, with pyruvic acid as the intermediate product. All the acids were, on standing, converted into other forms by microorganisms."

Maintenance of moisture-equilibrium and nutrition of plants at and below the wilting percentage, J. F. BREAZEALE (*Arizona Sta. Tech. Bul. 29 (1930), pp. 137–177, figs. 14*).—Continuing earlier work (E. S. R., 61, p. 619), it is concluded that "the contact of moisture film is continuous from the soil to the growing plant at all soil moisture percentages above the wilting percentage"; and further, that "a plant may absorb moisture from any soil horizon where water is available, for example, a subsoil, and transport this moisture to another horizon where moisture is scarce, for example, the surface soil. It may there exude this water, dissolve, and absorb certain amounts of nutrient materials."

It is considered, also, on the basis of the detailed and varied experiments described, that "nutrient ions are probably taken up by the plant as electrical charges," the direct water contact between plant and soil permitting the entrance of ions "even after all soil water movement has ceased," so that, for example, "plants are able to draw nutrient materials from a soil which is maintained at the wilting percentage."

Available soil moisture is defined as "that water which is held by the soil with a force of less than the suction force of the plant, or a force of less than about 5 atmospheres." The wilting percentage of a soil "is assumed to be the state of equilibrium which exists between the suction force of the plant and the adhesive forces of the soil," and was found to vary with the type of plant, the root distribution, root length, the transpiration rate, and other factors.

Variations in the degree of dispersion of soils under different conditions [trans. title], V. N. KHARCHIKOV (*Zhur. Opytn. Agron. IUgo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*, *6* (*1928*), *No. 2*, *pp. 13–23*).—A number of soils in grass and old sod under varied conditions were studied.

Using the moist soil, 25-gm. samples were shaken with water for 2 minutes in a cylinder 3.8 cm. in diameter. The water reached a height of 10 cm. in the cylinder. The soil was then allowed to stand for 1-, 7-, and 21-day periods, and 50 cc. samples were siphoned off, evaporated to dryness, heated in a furnace at 150° C., weighed, and the residue taken up with water and filtered. The filtrate, evaporated again and weighed, was considered to represent the molecularly dispersed ingredients, while the difference in weight between it and the first evaporation residue was taken as representing the colloidally dispersed materials.

The results are summarized as follows: (1) The degree of dispersion of soils is not a constant, but varies within wide limits, depending on various conditions and during the different vegetation periods. (2) The course of change in dispersion is the same on chernozem, solonetz, and solonchak, the dispersion increasing during the spring and fall. The average dispersion of the plowed layer in chernozem is 3 per cent, in solonetz 9 per cent, and only tenths of a per cent in solonchak. The layer under the plowed layer has a lower dispersion. It decreases 3 times in the chernozem soil, 88 times in the solonetz, and increases slightly on the solonchak. In respect to the soil depth the dispersion increases to a maximum with the depth and then drops. This maximum is close to the surface in the solonetz, deeper in the chernozem. (3) In general the degree of dispersion is high under corn and fallow conditions, low in sod. Drying of soils influences the dispersion inasmuch as some colloids are irreversible. (4) The various grasses, like bromegrass, tall oatgrass, and alfalfa, vary in respect of their influence on the dispersion of soils in the order mentioned, being the highest under bromegrass. (5) There is a definite relation between dispersion and moisture content, water soluble calcium and hygroscopicity. With an increase in moisture content of the soil, the dispersion increases. An increase of soluble calcium in the soil decreases the dispersion. A lowering of dispersion decreases the hygroscopicity.

Equilibrium between soil and electrolytes and its influence upon some lime requirement methods, N. A. CLARK and E. R. COLLINS (*Soil Sci.*, *29* (*1930*), *No. 6*, *pp. 417–427*, *pl. 1*, *figs. 5*).—An investigation of titration methods for determining lime requirement forms the subject of this contribution from the Iowa State College. It includes "a comparison . . . made on 21 Iowa soils of varied pH by titration with $Ca(OH)_2$ on the soil suspension in water and in $CaCl_2$ solution and with NaOH in NaCl solution." In these experiments continuous stirring was employed in place of shaking, the samples for pH determination were removed from the main reaction mixture, and the measurements were made by means of the quinhydrone electrode.

"The time of equilibrium varied with the soil, but there was little change after 90 hours. Generally, equilibrium was more rapid in the salt suspensions." The "lime requirements" indicated in the titrations of the soils suspended in solutions of calcium chloride or of sodium chloride were much higher than were the corresponding figures for suspensions in water. In fact, "with one exception, the requirement by the $CaCl_2$ suspension, measured on mixing, was from 2 to 3 times as great as that by titration with $Ca(OH)_2$ alone; measured at 90 hours, the requirement was 2.5 to 5.5 times as great. These figures are in the order of Christensen and Jensen's measurements [E. S. R., 56, p. 17], in which they found approximately 3 times as much lime was needed in the field as was shown by the simple titration method with $Ca(OH)_2$. The results do not indicate that the instantaneous neutralization suggested by Saint [E. S. R., 56, p. 17] and by De 'Sigmond and Di Gleria extends to the total hydrogen on the complex."

[Soil chemistry and bacteriology] (*Idaho Sta. Bul. 170 (1930), pp. 10, 17*).—Several items concerning the soil investigations of the station are noted.

Slick spot investigations.—The total replaceable base content was found greater in the slick spot soil than in normal soil. Replaceable calcium was found in large amount, sodium in small amount, both in the slick spot soils and in the normal in the fields examined; and in both slick spot and normal soils "the upper horizon is low in repleaceable bases, the second very high and then decreasing with depth."

Alkali reclamation.—The highly deflocculated soils of high carbonate content continue to be barren. A well of a depth of 30 ft. was found to have lowered the general water table and to have affected slightly the perched water table.

Helmer soil studies.—"The return of crops, especially legumes to the soil, slowly is increasing the nitrification in the virgin soils. The carbon dioxide production does not seem to be proportionate to crop production nor to the return of plant materials to the soil."

Forest soils.—A toxic factor the presence of which in raw cleared forest soils was indicated, was found to be without apparent effect upon ammonifying organisms but to interfere definitely with nitrate-producing forms. Lime, either with or without gypsum, increased bacterial numbers and nitrate formation, and also carbon dioxide production.

Success with sandy soils, A. R. Albert and A. R. Whitson (*Wisconsin Sta. Bul. 416 (1930), pp. 64, figs. 19*).—The following is a summary statement of the advice contained in this bulletin: "Check blowing of sand and field erosion (washing). Increase the organic matter with livestock manures and green manures. Grow more legumes. Use lime and potash and phosphate fertilizers on the legumes when needed. Reduce the losses of plant food elements through proper care of manure and the use of catch crops."

The use of legumes and the choice of legumes suitable for special cases of the general problem are given particular attention.

Farm soils: Their management and fertilization, E. L. Worthen (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 1. ed., corrected, pp. X+410, pl. 1, figs. 199*).—This second printing of the edition already noted (E. S. R., 58, p. 116) appears altered only by a few minor corrections.

Rocky Ford niter investigations, R. Gardner (*Colorado Sta. Rpt. 1929, pp. 22–24*).—Work on excessive soil nitrates was essentially similar to that noted from the previous year's report (E. S. R., 61, p. 115).

Nitrogen fixation in relation to legumes and non-legumes under defined agronomic conditions, J. E. Fuller (*Massachusetts Sta. Bul. 260 (1930), pp. 338, 339*).—It is concluded that "the nitrogen fixation in the experimental field is correlated with the presence of a strain of Azotobacter capable of fixing substantial quantities of nitrogen when cultivated in pure culture in a nitrogen-free medium. Nitrogen fixation and the distribution of the Azotobacter appear to have remained reasonably constant over a 3-year period. The growth of the legume and nonlegume crop has not influenced nitrogen fixation or the distribution of the Azotobacter. The hydrogen-ion concentration of the soil of the experimental field does not appear to be the controlling factor in the nitrogen fixation or the distribution of the Azotobacter. The data as accumulated in this study have furnished considerable information which may later be placed on a basis for the establishment of practical methods by which the nitrogen fixation organisms naturally present in soil may be stimulated to greater activity."

Nitrogen fixation in the presence of or as a result of the growth of legumes versus non-legumes under certain defined agronomic conditions, F. W. Morse (*Massachusetts Sta. Bul. 260 (1930), pp. 360, 361*).—The dry matter and the nitrogen yields of clover plats and of grass plats on land not treated with nitrogenous fertilizer since 1882 are shown. "The particularly interesting result is that, after an interval of five years of continuous cropping and removal of nitrogen, the soil, which has not grown a leguminous crop in that period, held its own and something more, measured by both dry matter and nitrogen in the crops removed this year."

Report of the chemist, W. P. Headden (*Colorado Sta. Rpt. 1929, p. 31*).—The work on the effects of clover and alfalfa in rotation and on soil carbon dioxide (E. S. R., 57, p. 113) is reported as finished in 1929.

"The main features of the results were that we did not find any significant increase in the total nitrogen in the soil, and the nitric nitrogen was continuously very low. The carbonic acid in the soil atmosphere was maintained at very much larger quantities under these crops than in fallow land. The soil complex in the soil experimented with corresponded to 13 hydrogen atoms and was not affected by the crops. The water-soluble potassium was quite abundant in the soil and varied in different portions of the plat, but in all cases was greatly increased by the growing crops. There is in this soil a large quantity of potassium that forms no part of the soil complex. The variation in the water-soluble phosphoric acid was not followed. . . .

"The wheat yield was the largest after fallow and smallest after alfalfa, the difference being 18 bu. per acre. The protein content was highest after alfalfa and lowest after corn. After alfalfa it was 19 per cent, after corn 12.25 per cent, after clover 17.5 per cent, and after fallow 17.25 per cent."

The isolation of a bacteriolytic principle from the root nodules of red clover, E. R. Hitchner (*Jour. Bact., 19 (1930), No. 3, pp. 191–201*).—Contributed from the Universities of Maine and of Wisconsin, this report notes the isolation from the root nodules of red clover of an agent "which produces lysis of a strain of the red clover nodule bacteria isolated from these nodules." The lytic agent was carried through 20 serial transfers and filtrations in the presence of the corresponding organism without having been found to lose in activity; but the potency of the filtrate did not, on the other hand, increase markedly during these transfers. The agent was found specific for its own homologous strain and did not produce lysis of stock strains of the red clover nodule bacteria or of strains isolated from peas, beans, alfalfa, or vetch. Continued incubation of the treated cultures resulted in a secondary growth, from which were isolated bacteria resistant to the lytic action of the agent. Some further related observations are recorded.

The utilization of nitrogenous organic compounds and sodium salts of organic acids by certain soil algae in darkness and in the light, C. E. Skinner and C. G. Gardner (*Jour. Bact., 19 (1930), No. 3, pp. 161–179*).—In an investigation reported from the University of Minnesota, pure cultures of a *Pleurococcus* sp., a *Cystococcus* sp., a *Chlorella* sp., and a variety of *Scenedesmus costulatus*, together with an unidentified strain of green algae, were grown in liquid and in agarized Moore's solution, both in diffuse sunlight and in total darkness. Glucose, gelatin, peptone, egg albumin, casein, as well as citric acid, lactic acid, malic acid, oxalic acid, succinic acid, and tartaric acid were added to these media, the mixtures having been brought to pH 6.0 by means of suitable additions of sodium hydroxide. It was found that the organic compounds (except oxalic acid) caused an increased growth of some of the algae when grown either in light or in darkness on slightly hydrolized agar.

Glucose and the organic nitrogenous compounds were found to serve as the sole source of energy in varying degrees for some of the algae when grown in total darkness in liquid media. The organic acids (except oxalic acid) supported a slight and delayed growth of three of the species, but none of the algae was able to use all of the acids tested.

Fertilizer problems and analysis of soils in California, D. R. Hoagland (*California Sta. Circ. 317* (*1930*), *pp. 16*).—This is a nontechnical discussion of the following topics: Chemical elements of the soil essential to plants, chemical composition of the soil moisture and the formation of acids in the soil, the absorption of essential elements by roots, availability of potassium and phosphate, use of fertilizers, cover crops and rotation of crops, use of animal manure, fertilization and quality of crop, acid and alkaline soils, and soil analysis.

Crop yields from Illinois soil experiment fields in 1929, F. C. Bauer (*Illinois Sta. Bul. 347* (*1930*), *pp. 321–368, fig. 1*).—This continues the series previously noted (E. S. R., 61, p. 423), with a general summary for the rotation periods ending in 1929. "These results again emphasize the fact that no one system of soil improvement will give the best results on all soils. . . . The most effective system for any particular field changes from time to time, tending to go from the simpler to the more complex. A clear lesson from these data is that farmers must be constantly on the alert if they are to make the most economic use of their soils."

Department of agronomy (*Indiana Sta. Rpt. 1929, pp. 13–16, figs. 2*).—The following items of soil amendment and fertilizer work are reported:

Comparison of soil liming materials.—Ground limestone and marl were found the most practical liming materials for Indiana soils. Both in the first and in succeeding years 10-mesh and 50-mesh ground limestone and marl "have produced as large crop increases . . . as hydrated lime and at a very much lower cost per acre." Further, the 50-mesh limestone was found no more effective than the 10-mesh. Even 4-mesh limestone screenings, though less effective than the finer materials, "may be satisfactorily used for soil liming if applied in somewhat larger amounts."

Fertility experiments on light sand.—"With this treatment [complete fertilizer and liming] this very light sand, which had been abandoned as useless, produced 51 bu. of corn, 25 bu. of soybeans, 17 bu. of wheat, and 2,880 lbs. of mixed clover and timothy hay" an acre. On the same soil (a light sand experiment field near Culver) nitrogen in top-dressing for corn, wheat, and rye produced crop increases to the value of twice the cost of the nitrogen.

Soil improvement value of cornstalks and straw.—"It is not possible to distinguish the effects of the different materials, but collectively they have had an average value per ton of $3.03 at Worthington, $3.57 at Bedford, $3.62 at La Fayette, and $4.65 at Jennings County."

Fertility of subsoil.—The experiments were made upon that portion of the subsoil lying between 6 and 15 in. below the surface; consisted in the determination of yield, as compared with that from the surface soil, produced without fertilizer, with complete fertilizer and liming, and with either one of the fertilizer elements or the lime omitted; and are considered to indicate that erosion exposes, on the principal soils of Indiana, layers very deficient in nitrogen and phosphorus and deficient to a lesser extent in lime and in available potassium. "Without phosphate, the subsoil produced only 29 per cent as much as the surface soil; without nitrogen it produced 35 per cent as much as the surface; without potash it produced 83 per cent as much as the surface; and without lime, 94 per cent as much as the surface soil."

Field experiments with fertilizers on some Iowa soils, W. H. Stevenson, P. E. Brown, et al. (*Iowa Sta. Bul. 269 (1930), pp. 165–202, figs. 20*).—Field fertilizer experiments of the usual type, carried out under a good rotation on well drained and cultivated lands, representing 8 individual soil types, and including more than 100 soil experiment fields, are here recorded in some detail. The importance is emphasized of keeping up a good supply of organic matter, liming, and the use of phosphorus fertilizer. "Complete commercial fertilizers may be applied to some Iowa soils profitably, but it seems that superphosphate may give quite as good results and even greater profits."

Winogradsky method of testing soil deficiencies, W. G. Sackett (*Colorado Sta. Rpt. 1929, pp. 21, 22*).—A comparison of the Winogradsky with the Neubauer method (E. S. R., 50, p. 118) indicated a "very close correlation," and led to the opinion that the method "is sufficiently reliable to warrant . . . recommending it as a routine procedure in testing soils for phosphate, potash, and lime deficiencies." The method was applied during 1929 to the examination of soils from more than 200 farms and in most cases indicated a probable benefit from the addition of phosphate. In field fertilizer tests with sugar beets, "where . . . tests showed nothing lacking there was no benefit from the fertilizer."

Potash in relation to growth and development of plants (*Indiana Sta. Rpt. 1929, p. 67*).—Sand culture and plat experiments on the growth of corn at three rates of potassium supply—in the case of the plat experiments, applications of 0, 36, and 126 lbs. of potassium, calculated as oxide, to the acre—showed that the sugar content was correlated with the potassium supply. The plants grown on plats treated with 126 lbs. of potash to the acre had a sugar content much higher than had those from the other plats, "the increase in some cases amounting to over 1,000 per cent."

AGRICULTURAL BOTANY

Electric reaction and excitability in plant cells [trans. title], Mr. and Mrs. Lapicque (*Compt. Rend. Acad. Sci.* [*Paris*], *184 (1927), No. 24, pp. 1480–1482*).—A somewhat comparative discussion is given of so-called blaze currents in plants and changes related to muscular excitation in animals.

The colloidal protein content of living plant cells [trans. title], T. Bokorny (*Kolloid Ztschr., 44 (1928), No. 2, pp. 166–173, figs. 6*).—The author gives a review and evaluation of published statements of fact and opinion, also a statement of the present author's findings, regarding the constituents, characters, and responses of colloidal proteins in plant cells, particularly of *Rosa centifolia*, *Lythrum salicaria*, and *Rhododendron* sp.

Two-salt mixture of minimum toxicity for plants [trans. title], L. Maume and J. Dulac (*Compt. Rend. Acad. Sci.* [*Paris*], *184 (1927), No. 18, pp. 1081–1083, fig. 1*).—From a study using the types of solutions employed by Osterhout (E. S. R., 31, p. 627), it appears that the minimum of toxicity of each two-salt mixture has always the same abscissa as the point where the two curves of ionization meet.

Variation of antitoxic quality as a function of ionization [trans. title], L. Maume and J. Dulac (*Compt. Rend. Acad. Sci.* [*Paris*], *184 (1927), No. 20, pp. 1194–1196, fig. 1*).—Having defined above the minimum of toxicity toward germinating wheat in a two-salt mixture as a physicochemical property of the medium, the authors now state that the relation is not changed if, while the concentration-ratio remains unchanged, the concentrations themselves be increased or diminished.

In the mixtures of chlorides (NaCl and $CaCl_2$) here employed, the minimum of toxicity appears to correspond to those properties of the two salts which, if separately dissolved in a volume of water equal to that of the mixture, furnish solutions having the same coefficient of ionization.

Forfeiture of functionality by amyliferous plastids in leguminous cotyledons [trans. title], A. Maige (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 3, pp. 162–164*).—Mentioning without indicating specifically his previous related work, sections of which have been noted (E. S. R., 53, p. 826; 57, p. 319; 58, pp. 523, 524; 59, p. 217), the author states that his former interpretation, that the plastidial surface may be considered as having given up or lost all physiological activity in connection with the grains of starch in the cotyledons of legumes during germination which undergo an active internal digestion and progress to their solution, has been confirmed by evidence which is here presented.

The beginning of hydrolysis in adult seeds is indicated by the physiological exhaustion of the amyliferous plastids as shown by the appearance of breaks, but the change shows a variable duration.

Synthesis of proteins by saccharomyces [trans. title], J. Effront (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 22, pp. 1302–1304*).—Aerobic and anaerobic factors, changes, and products are indicated.

Microbial oxidation of sulfur in the course of ammonification [trans. title], G. Guittonneau (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 1, pp. 45, 46*).—It is claimed to have been found that in a liquid medium which remains neutral or becomes alkaline, the presence of bacteria of a certain group may condition the solubility of sulfur in the hyposulfite state, whereas those of another group previously reported upon (E. S. R., 55, p. 627) proved to be able to transform hyposulfites into sulfates. Further differences between these two groups are indicated, with studies testing the behavior of groups which are indicated in tabulation.

Soluble ferments in black mustard [trans. title], A. Astruc and M. Mousseron (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 2, pp. 126–128*).—Seeds of *Brassica nigra* are rich in soluble ferments. Myrosine, invertine, amylase, maltase, emulsine, and an anaeroxidase are mentioned in this connection.

Sodium in plants [trans. title], G. Bertrand and J. Perietzeanu (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 11, pp. 645–649*).—Percentages of sodium content for fresh, dry, and ash matter are tabulated for about 30 plants, including tobacco (leaves), maize (roots, stems, seeds, and leaves), and other economic plants.

Influence of sodium carbonate and of calcium chloride on sap acidity in maize [trans. title], S. Karasiewicz (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 20, pp. 1192–1194*).—Particularizing studies on sap acidity in *Zea mays* grown in sodium carbonate or in calcium chloride, the author concludes that the difference in the action of the salts of the two groups is probably more apparent than real, though the sodium salts, being more readily soluble, are more freely excreted by the roots or thrown off nocturnally by the leaves than are the calcium salts, which are liable to fixation within the plant in the form of oxalate.

Data from ringing experiments on plants and their significance as regards movements of materials [trans. title], T. Weevers (*Rec. Trav. Bot. Néerland*, *25A* (*1928*), *pp. 461–474*).—Referring to certain contributions made by Dixon (E. S. R., 48, p. 430; 56, p. 424), but not to other related accounts (E. S. R., 52, p. 27; 54, p. 521), the present author states that he was unable to confirm that author's view that the transport of organic materials takes place by way of the peripheral xylem. In general, that movement goes on by way of the soft bast.

Transfer of organic materials via the upward moving stream in the wood takes place, however, before growth and on its inception. Later, movement through the phloem becomes necessary to the development of the young shoots.

New grafts [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 18, pp. 1084, 1085*).—The author, referring to his account of basic plans and procedures in grafting as previously noted in some detail (E. S. R., 12, p. 947), indicates several recent successes in grafting plants of different genera and diverse modes of living.

Solar activity and vegetational phenomena [trans. title], T. MOREUX (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 18, pp. 1090, 1091*).—It is claimed that observations carried on during several years, though not complete or decisive, show some correspondence between sun spots and crop returns in the case of wheat and of grapes.

Frost damage to young coniferous trees, A. W. BORTHWICK (*Scot. Forestry Jour.*, *42* (*1928*), *pt. 2, pp. 63–68, pls. 2*).—Winter freezing of soil prevents root absorption while relatively warm sunshine or else drying cold wind increases water loss from the leaves. As a result young coniferous trees may undergo wilting and browning of the leaves and other injury which may not become apparent until revealed by the scorching and backwardness in the spring. Water may change to ice in nonliving wood but not in living cells, though in this case the water is extruded and formed into little rods of ice in the intercellular spaces. If now a rapid thaw occurs, these spaces become flooded with free water which in sunshine or dry wind is rapidly lost, and as the result the leaves, before they can be resupplied with water, may droop, brown, and scorch as in severe drought. The resultant damage is due not so much to the actual freezing as to the manner of thawing. Thus frozen plants brought into a warm room invariably wither, while those which are shaded, sprayed with water in the open, or allowed to thaw gradually, usually recover completely. Thus, also, in the case of young conifers and seed beds, the damage is found to be less on northern exposures or in situations otherwise not much exposed to the direct sunshine.

Frost damage varies with soil, situation, species, and even individuals. Water content is an important factor as regards leaf, shoot, or bud. Age confers hardiness. Late or early frosts are the more significant. Damage may vary from partial check to complete killing. The significance of indications, largely minute, is detailed, as are diagnostic symptoms.

Plant material introduced by the Office of Foreign Plant Introduction, Bureau of Plant Industry, January 1 to March 31, 1929 (*U. S. Dept. Agr., Inventory 98* (*1930*), *pp. 67*).—Descriptive notes are given on about 1,500 lots of seeds and plants introduced for trial into the United States.

GENETICS

The inheritance of germless seeds in maize, J. B. WENTZ (*Iowa Sta. Research Bul. 121* (*1930*), *pp. 345–379, figs. 2*).—Germless seeds in corn are characterized by the sunken and often wrinkled area on the germinal side directly over the normal position of the germ, and the lack of a sharp margin around the germinal area. The endosperm generally is normal in size and shape, and the germless seeds ordinarily can not be distinguished by the appearance of the abgerminal side. The germ in a high percentage of cases is entirely lacking, and often there is a vacant cavity where the germ would be in a normal seed. In all, germless seeds were observed in selfed ears from 23 different named varieties. The present study suggested that the inheritance of germless seeds is more complex than reported by Demerec (E. S. R., 50, p. 528).

Inheritance studies with two different factors, *gm_2* and *gm_1*, which cause germless seeds, showed their linkage relations with factors in linkage group II. The factor *gm_2* was found linked with *R*, with 27.11 per cent of crossing over as compared to 31 per cent reported by Demerec (E. S. R., 55, p. 526). However, *gm_2* did not show in F_2 linkage with *G* or *Pg_1*. Lack of evidence of linkage with *G* was explained by assuming *gm_2* to be located to the left of *R*, while *G* has been shown by Lindstrom (E. S. R., 37, p. 526; 39, p. 825) to be located to the right of *R*, with a crossover percentage of 20. The lack of evidence of linkage with *Pg_1* was explained likewise after the presentation of data to show that *Pg_1* is also located to the right of *R* near *G*, with 14.57 per cent of crossing over between *G* and *Pg_1*.

The data did not reveal linkage between *gm_1* and *r* or *c*, between *gm_1* and *Pr*, between *Pr* and *G*, or, contrary to Hayes and Brewbaker (E. S. R., 56, p. 519), between *R* and *Pr*. Evidence of linkage between *gm_1* and *G* was not conclusive. A crossover percentage of about 20 between *R* and *G* was in accord with Lindstrom's data, and that of 23.39 between *R* and *Pg_1* agreed with the findings of Brunson (E. S. R., 51, p. 229).

Inheritance of anthocyan pigmentation in rice, J. W. JONES (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 12*, *pp. 1105–1128*).—The mode of inheritance of anthocyan color in crosses between rice varieties having white kernels and normally green vegetative organs and those having kernels red when hulled and certain of the vegetative organs colored was studied cooperatively by the California Experiment Station and the U. S. Department of Agriculture at the Biggs, Calif., Rice Field Station. The word "green" is used to denote normal green color, except in awns, which are normally straw-colored at maturity, while "colored" or the name of the color is used to denote the presence of anthocyan pigmentation.

In the crosses Niro Vialone × Caloro, Butte × Colusa, Colusa × Italian Red, Eureka × Caloro, and an unnamed variety C. I. 5346 × Italian Red, all organs that were colored in the Niro Vialone, Butte, Eureka, and Italian Red varieties were colored in the F_1 hybrids.

The F_2 segregation for purple color of the leaves and leaf sheaths in Niro Vialone × Caloro produced numbers fairly close to a 27:9:28 ratio. Segregation for color of the awns and lemma and palea apexes in Niro Vialone × Caloro, Colusa × Italian Red, and C. I. 5346 × Italian Red produced numbers in F_2 agreeing with a 9:3:4 ratio, and Niro Vialone × Wataribune produced plants with purple, red, and green lemma and palea apexes in the ratio of about 9:3:4. Butte × Colusa segregated for color of both awns and apiculi in a ratio of 3 red to 1 green. For color of the internodes, glumes, and stigmas the F_2 segregation in Niro Vialone × Caloro was in a 9:7 ratio of purple to green. Colusa × Italian Red in F_2 produced plants with purple and green internodes in a 27:37 ratio and plants with purple and green glumes and stigmas in a 9:7 ratio, and Niro Vialone × Wataribune produced plants with purple and green internodes in a 9:7 ratio. Niro Vialone × Caloro produced in F_2 plants with the nodes, ligules, auricles, and pulvini purple and green in the ratio of 27:37. F_2 segregation in Colusa × Italian Red produced plants with the ligules, auricles, and pulvini purple and green in a 9:7 ratio, while the plants with purple nodes and with green were about equal in number. In Niro Vialone × Wataribune the F_2 produced plants with purple and green nodes in the ratio of 9:7.

In F_3 the green strains bred true, and the colored strains either bred true or segregated into different ratios.

The colors of the four groups of colored organs, i. e., leaves and leaf sheaths, awns, lemma, and palea apexes, internodes, glumes, and stigmas, and nodes, ligules, auricles, and pulvini, were inherited separately in Niro Vialone × Caloro. Color in each group was inherited as a unit, however, and evidently was due to the same and not to completely linked factors. With respect to the colored vegetative organs, the Niro Vialone parent seemed to have the dominant complementary factors *ACP* and the Caloro parent the recessive factors *acp*. The interaction of these three factors gives the colors observed in the four groups of organs mentioned, while no color develops in the absence of factor *C*.

In Colusa × Italian Red the color of the awns, lemma, and palea apexes, of the glumes and stigmas, and of the ligules, auricles, and pulvini was inherited in each group of organs as if it were due to the same genetic factors or to completely linked factors. The color of awns and apiculi and of lemma and palea apexes in Butte × Colusa and C. I. 5346 × Italian Red also was inherited as a unit. The F_2 segregation, in Colusa × Italian Red and C. I. 5346 × Italian Red, for color of the seed coats, as seen in hulled kernels, produced approximately 3 red-kerneled plants to 1 white-kerneled plant.

Two (or more) factors acting together were found necessary for the production of purple color in all organs.

The persistence of precocity in plants [trans. title], P. Lesage (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 1*, *pp. 40–42*, *fig. 1*).—In an account of work related to that previously noted (E. S. R., 58, p. 522), it is stated that seeds of garden cress, matured while fulfilling certain conditions under glass, produced when grown in the open at Rennes plants showing precocity which proved heritable at least to the fifth generation while growing in the open air after a period under glass. This is thought to be due to several causes but principally to heat. Curves and details are given.

Studies on the plumage of the Silver Spangled fowl (*Connecticut Storrs Sta. Bul. 163* (*1930*), *pp. 29–82*, *pls. 12*).—The results of three studies are reported in this publication.

I. *The expression of the spangled pattern during growth*, L. C. Dunn and W. Landauer (pp. 31–46).—A general description was made of 50 purebred Silver Spangled chicks at 3 days of age, at 7 days of age, and at 2-weeks intervals thereafter during the first 16 weeks of growth. The records consisted of descriptive notes, samples of feathers clipped at time of observation, and photographs.

It was found that the spangled pattern appeared gradually during growth through the replacement of early nonspangled feathers. Practically all the feathers that appeared before 25 days of age did not show the spangled pattern, while those appearing after that age showed the pattern. The first spangled feathers of the primaries appeared in the second generation of definite feathers, while in the pectoral region the spangled feathers appeared in the first generation directly succeeding the down.

The results indicate that the genetic constitution of the follicle is only one factor in the reaction that produces the spangled pattern. The nature of the general change in the body of the spangled fowl which appears to take place at some time preceding the fourth week of age is unknown, but may be due to the release of internal secretions or to differences in temperature during the development of the early and late feathers. A cross penciling pattern that appeared early from the same follicles which later produced spangled feathers was also observed. The chief ontogenetic significance of this difference between successive feathers was to show the wide range of responsiveness of the feather follicles during early growth.

II. *Feather growth and feather pattern during forced regeneration*, W. Landauer and L. C. Dunn (pp. 47–69).—Observations on the growth and pattern in successively regenerating feathers from follicles of different body regions led to the conclusion that feathers from the throat, breast, pelvic wings, and saddle require about 6 to 8 weeks for full growth and that no striking sexual difference occurs in the growth of these feathers. While a follicle may regenerate feathers one after another without a resting period over a number of years, in most cases the follicle ceases to be active after regenerating a number of feathers and only becomes active again at the time of the next general molt. The regenerative activity of the follicles appears to be determined by individual characteristics.

Males showed a significantly lower regenerative activity of the follicles of the pelvic wings than of the breast and throat, and in the breast region and probably in the throat the regenerative activity was much higher for males than for females. The size and shape of the feathers remained the same throughout a series of regenerating feathers, and with but few exceptions the spangled pattern, irrespective of its size, was retained. The pattern size in crossbred birds was more variable than in purebred birds, but the size and shape of feather apparently did not influence the variation in spangle size.

There was no correlation between the size of spangle of the original feather and the variability in pattern size of subsequent regenerated feathers, but there was a positive correlation between variations in pattern size of series from the right and left sides of individual birds. Sex did not influence the variations in pattern size. In some series of regeneration there was a tendency to decrease pattern size, in others to increase it, and still others showed no change. In most cases, however, the original pattern size was reestablished at the time of body molt.

The observations indicated that the degree of variability was in general determined by the constitution of the individual and not by the properties of the follicles, and the material suggests that all the follicles of a particular region have the same potentialities. Three sets of parallel characteristics of the different body regions were observed, namely: "(1) During the feathering process of the chicks the first feathers to appear are typically spangled in the throat, they are gray with white tips in the breast, and black in the pelvic wings. (2) In the adult plumage all feathers are spangled in the throat, some unspangled feathers usually are found in the breast, while as a rule relatively many unspangled feathers are present in the pelvic wings. (3) The percentage frequency of feather series with a high coefficient of variation of spangle size increases from the throat over the breast to the pelvic wings." In only exceptional cases did the pattern in series of successively regenerated feathers show irregularities, and only in one case, in a series of saddle feathers, was the spangle lost entirely.

III. *The symmetry conditions of the spangled pattern*, W. Landauer (pp. 71–82).—In this study it was found that in the ventral feather tracts of the throat, breast, and pelvic wings the majority of feathers on the left side of the body showed a spangle in which the pigmented area on the right side of the rachis extended further toward the base of the feather. On the right side of the body the opposite type of asymmetry was found. In the throat region most of the feathers on the left side of the median line showed the right type of asymmetry, and the percentage of feathers with the opposite type increased with the distance from the median line. The reverse was true on the right side of the body. In the left wing bow and wing coverts, the majority of the feathers had the left type of asymmetry, and the feathers in the right wing the right type. A definite sequence of different pattern types was found in the wing coverts of the males.

In series of successively regenerated feathers, the majority of feather series with consistent asymmetry originated from feathers with a spangle showing the left type of asymmetry, while the majority of feather series with alternating asymmetry originated from feathers with a spangle of the right type of asymmetry. When the proportions of original feathers with the left and right asymmetry type of pattern were compared with the proportions of feather series with consistent and alternating asymmetry in the throat, breast, and pelvic wing regions of each body side, both were of similar nature in every case. However, on the left body side the proportions of right to left type and on the right body side the proportions of left to right type resembled the proportions of consistent to alternating series.

The size of the spangle, the degree of variability of the pattern, the body side in which the feathers grew, and the feather tract had no appreciable influence on the symmetry behavior of series of successively regenerated feathers.

Studies in embryonic mortality in the fowl, I–III (*Roy. Soc. Edinb. Proc., 49 (1928–29), No. 2, pp. 118–130, pl. 1; pp. 131–144, pl. 1, fig. 1; pp. 145–155, pls. 3*).—The three following papers give the results of studies of chick embryos found in about 12,000 eggs which failed to hatch in 3 commercial flocks and in the flock of the Animal Breeding Research Department at the University of Edinburgh.

I. *The frequencies of various malpositions of the chick embryo and their significance*, F. B. Hutt.—Among 8,295 unhatched embryos which died after the eighth day there were 1,935 which died before the tenth day, 929 which died from the tenth to the seventeenth day of incubation, and 5,050 which were approximately fully formed. The position of the last group of embryos was studied, and 55.85 per cent were classified into four major groups. The fatal results of these positions were due to the location of the beak away from the air cell or the burying of the beak between the thighs.

II. *Chondrodystrophy in the chick*, F. B. Hutt and A. W. Greenwood.—The occurrence of chondrodystrophic embryos was found to vary from 0.80 to 7.96 per cent in 4 different flocks. The incidence of chondrodystrophy was found to vary with the season and individual fowls, but was independent of breed, sex, and age of dam. It is suggested that it is due to a hereditary physiological abnormality which under unfavorable conditions results in chondrodystrophic embryos.

III. *Chick monsters in relation to embryonic mortality*, F. B. Hutt and A. W. Greenwood.—Teratological monsters were found in 433 eggs which failed to hatch. Of these 93 per cent were in the groups designated as hyperencephaly, exencephaly, and microphthalmia. The occurrence of the monsters showed some seasonal variation, but was independent of sex. The suggested cause of the production of monsters was arrested development at a critical stage.

On the relation of fertility in fowls to the amount of testicular material and density of sperm suspension, F. B. Hutt (*Roy. Soc. Edinb. Proc., 49 (1928–29), No. 2, pp. 102–117*).—Data are reported on the fertility of the eggs produced by hens stud mated with 11 cocks, some of which were partially castrated. The fertility of the eggs did not appear to be dependent upon the amount of testis material in the male. Similar results were obtained for 3 flock-mated males.

The data also include the concentration of sperm in the semen and the weight of ejaculated material, which were also independent of the amount of testis material. Compensatory hypertrophy approximating the normal weight of both testes was observed in cases of unilateral castration, except that the birds did not show the compensatory hypertrophy when the testis removed was grafted subcutaneously in another region.

FIELD CROPS

[Agronomic work in Idaho in 1929] (*Idaho Sta. Bul. 170 (1930), pp. 13, 14, 26, 28–30*).—Varietal leaders in continued experiments (E. S. R., 61, p. 822) at the station included Mosida and Triplet winter wheat, Markton oats, Trebi and Ezond barley, Idabell field peas, and Ladak alfalfa. Nek, a new strain of sweetclover developed by the station, has purple, nonshattering seed and a crown similar to alfalfa. Breeding work and variety tests with wheat, barley, and oats are reported on from the substations.

Sodium chlorate, 1 lb. per gallon of water, proved generally effective in controlling quack grass, morning-glory, Canada thistle, Russian knapweed, and yellow toadflax.

Seeding trials showed that 8 lbs. of Grimm alfalfa seeded early without a nurse crop produces the maximum yields of hay, while with common alfalfa 10 lbs. of seed to the acre should be used. Profitable seed yields of red clover have been secured by using a stand similar to that required for hay production. A combination of deep tillage, the use of alfalfa and sweetclover as cover crops, and more thorough irrigation gave promising results in the improvement of the chlorotic condition found in many Idaho orchards. Gypsum and sulfur proved to be important soil amendments when legumes are to be grown in the cut-over areas, both giving yields profitable over the cost of application.

Cultural tests at the High Altitude Substation demonstrated the value of good summer fallow in growing winter wheat. Sweetclover had a pronounced effect in increasing the yield of wheat the second year after sweetclover, although a smaller wheat yield was obtained on dry farms the first year after sweetclover except in seasons of plentiful rainfall. Land that has grown sweetclover evidently should be summer fallowed for one year or used for a cultivated crop, as potatoes, before it is planted again to grain. In seeding tests, 32 qt. of oats per acre gave the best average yield.

The use of a cultipacker on spring grain seedings at Sandpoint increased the yield 5.1 bu. per acre, although the effect on fall wheat was not so striking. Early-seeded field peas have averaged 19.5 bu. per acre, those seeded 3 weeks later 16.4 bu., and 6 weeks later 10.9 bu. Alfalfa retained 80 per cent of its original stand after 4 years, while most of the clover strains were below 20 per cent. Sweetclover was effective in seedings made on burned-over areas. In all cases reseeding was heavy and the stand increased. It seemed futile to attempt to get a stand of grass where several years have intervened between the time of the fire and seeding. *Sclerotinia trifoliorum* reduced the stands of 1-year-old red clover plants 14.2 per cent, 2-year-old plants 32.9, and 3-year-old plants 53.8 per cent.

[Crop production research in Massachusetts], A. B. BEAUMONT, R. E. STITT, J. P. JONES, M. E. SNELL, E. J. MONTAGUE, C. H. PARSONS, R. C. FOLEY, F. A. WAUGH, and L. S. DICKINSON (*Massachusetts Sta. Bul. 260 (1930), pp. 331, 332, 335–338, 351, 352, 359, 360*).—Of various nitrogen compounds supplied Havana tobacco, the nitrates were the most readily assimilated, and urea, ammonium salts, asparagine, and cystine followed in order. Only cystine of the various amino acids of cottonseed meal, the principal nitrogen carrier in Connecticut Valley tobacco fertilizers, showed any appreciable assimilability, and only small amounts of cystine are said to be present in cottonseed. Neither cottonseed meal nor its hydrolyzed products gave indications of being assimilated in the unchanged form. The need of ammonification and nitrification of cottonseed meal before it could be assimilated fully by Havana tobacco was evident.

In varying degrees, ammonium salts and certain amino and amide compounds were found toxic to Havana tobacco. Browning and rotting of the roots and dying and dropping of the lower leaves accompanied this toxicity when the plants were grown in unsterilized media and containers, whereas when grown under sterile conditions with the same nitrogen forms, tobacco produced clean, white roots, indicating that the symptoms mentioned are secondary rather than primary effects of the nitrogen form. Grown in unsterilized solutions containing nitrogen as sodium or calcium nitrate or urea, plants produced healthy roots of a white or slightly brownish-white appearance. Mixtures of nitrate and ammonium salts were toxic in proportion to the concentration of the ammonium salts, while nitrate nitrogen tended to counteract the ill effect of ammonium nitrogen. It appeared that the toxicity of ammonium salts and certain organic compounds could not be explained satisfactorily by either physiological acidity or pH concentration. Improper metabolism caused by poor assimilation of nitrogen may offer the best explanation of all except the extreme cases of toxicity.

In 1929 brown root rot affected tobacco roots only slightly on the cover and no-cover crop plats, but injured very severely the roots of the tobacco in rotation with corn and hay, and to a lesser extent that in rotation with potatoes and onions. Contrary to experiments at other stations where large applications of superphosphate proved successful in counteracting the injurious effects of aluminum, assumed to be a factor in causing brown root rot, the results from such treatments were not particularly encouraging. Yield was not increased by the superphosphate, and brown root rot was as severe with as without the treatment. Assuming that superphosphate renders soluble aluminum inactive, the brown root rot found in the field evidently was not due to an excess of soluble aluminum, and it was a different type from that observed in the greenhouse cultures as resulting from aluminum injury.

The animal husbandry rotation, corn, hay, and tobacco, again produced a very poor crop of tobacco. In the cash crop rotation, potatoes, onions, and tobacco, the tobacco always has been superior to that in the animal husbandry rotation, although not usually comparable to continuous tobacco. The residues turned under in rotations did not reduce the available nitrogen to so low a point as to limit the growth of tobacco. In 1929 timothy did as well as either redtop or rye as a cover crop for tobacco, and the tobacco yield was about as high as on the plats without a cover crop. During 4 years redtop and rye were followed by as good yields of tobacco as the no-cover plats, whereas timothy depressed the tobacco yield in 3 of 6 years, although during the last 3 years it was about as good as the no-cover plats.

Treatment with manure and commercial fertilizer was only very slightly superior to a regular tobacco fertilizer, although it was possible to reduce the fertilizer about 25 per cent without impairing the yield or quality of tobacco. Tobacco grew about equally well on sawdust stable manure as on well-rotted manure from the station stables, and no injurious effect resulted from the sawdust. Without manure 150 lbs. of ammonia per acre seemed to be the minimum advisable in fertilizing tobacco, and for many fields 200 lbs. may be nearer the optimum. Tobacco responded in 1928 to excessive application of superphosphate with increased yields but not in 1929. It did not mature unusually early or any differently from that receiving no extra phosphorus.

Nitrogen in the forms of nitrate, ammonium salts, and urea seemed to be assimilated by the common tame grasses, although no distinct differences in growth in the respective media were observed as with tobacco. There was limited evidence that clovers assimilate nitrogen directly from nitrates and urea but not from ammonium salts. When different nitrogen forms were applied as top-dressings, pasture grasses responded quickly to nitrates, ammonium salts, and urea and slowly to calcium cyanamide. Rather large quantities of nitrogen did not eliminate white clover from the pasture flora. Conclusions from a study of grassland management under the Hohenheim system were recorded earlier by Parsons (E. S. R., 62, p. 131). Excellent turf of the basic grasses, bent, Kentucky bluegrass, and fescue, was maintained during a hot, dry season by monthly applications of castor-bean pomace or cottonseed meal. Unfertilized check plats dried severely, permitting invasion of weeds.

The tentative ranking of 10 alfalfa varieties in decreasing order of hardiness after two winters was Hungarian; Grimm, Ontario Variegated, Utah, Kansas, and Dakota 12; Cossack and Argentine; and Arizona and Ladak. Varietal or strain differences seemed much more significant than differences in fertilizer treatments within the range studied. Variety tests with soybeans and Canada field peas also are noted briefly.

Field work, Ohio Agricultural Experiment Station (*Ohio Sta. Spec. Circ. 27* (*1930*), *pp. 58, figs. 4*).—Resembling a previous publication (E. S. R., 60, p. 635), this circular gives the tabulated results of variety and cultural (including planting) trials with wheat, oats, corn, soybeans, alfalfa, and red clover; trials of barley varieties, spring grains, and summer annual forage crops; flax-cereal mixtures, corn with soybeans, and crop combinations for hay; and cutting tests with alfalfa and sweetclover. The responses of different crops to fertilizers, lime, manure, and crop rotations, and the results of experiments on the establishment and management of lawns also are summarized for various periods.

Experiments with legumes in Alabama, R. Y. Bailey, J. T. Williamson, and J. F. Duggar (*Alabama Sta. Bul. 232* (*1930*), *pp. 45, figs. 16*).—Investigations with legumes, largely at the station, from 1896 to 1929 dealt with their influence on the yields of succeeding crops; residual effects; influence of fertilizers and lime on yields; time, method, and rate of seeding; yields at different growth stages; nitrogen contents; seed production; and the effect of low temperatures on legumes.

Legumes maintained corn yields on land cropped continuously to corn during the 34 years, whereas without legumes corn yields declined more than half. In a 3-year rotation with legumes the yields of cotton and corn were four times as great as in the same rotation without legumes.

Applied alone in a 3-year rotation, phosphorus and potassium increased the average yield of seed cotton only 19 lbs. per acre and did not raise the yield of corn, but when applied in the rotation with legumes the acre yields were increased by 293 lbs. of seed cotton and 11 bu. of corn. Cotton following vetch made 1,231 lbs. of seed cotton per acre, as compared with 1,222 lbs. and 1,471 lbs. on adjacent plats treated with 325 lbs. of sodium nitrate and with 5 tons of manure, respectively. After legumes turned under March 25 and April 5 and 15, corn produced greater average yields during 5 years than corn on corresponding plats receiving 200, 300, and 400 lbs. of sodium nitrate per acre. Cotton following vetch turned March 25 outyielded that after vetch turned April 5 or 15.

Residues from vetch turned under in 1925, 1926, and 1927 produced more corn in 1928 than either 200 or 300 lbs. of sodium nitrate per acre and an increase of 13.1 bu. of corn in 1929. From vetch and annual yellow sweetclover turned under in the same years the residue resulted in an average increase of 224 lbs. of seed cotton in 1928. Kudzu turned under in 1919 increased the average yield of two crops of sorghum hay by 2,536 lbs. per acre, four crops of corn by 19.3 bu., and seven crops of oats by 7.9 bu.

Applied in rotations at four localities superphosphate resulted in increases of from 2,000 to 8,000 lbs. of green material per acre in the yields of winter legumes, and lime similarly produced increases of from 3,863 to 7,356 lbs. Six tons of manure applied with superphosphate and lime in rotations increased the yields of green material from winter legumes by 3,500 to 9,000 lbs. Ground limestone and basic slag produced about the same yields of vetch, but the limestone produced more than twice as much annual yellow sweetclover as did the slag. The sweetclover failed on Norfolk soil without lime. In a 3-year rotation lime increased the yields of summer legumes 34 per cent on Decatur clay loam, 59 on Ruston loam, 67 on Greenville sandy loam, and 68 per cent on Cecil clay loam.

Larger yields were made by hairy vetch, Monantha vetch, and Austrian Winter peas when in drills 12 in. apart than seeded broadcast. Planted September 30 at light seeding rates Monantha vetch and the peas produced more green matter than from heavy rates planted October 26, and these legumes produced enough green material to turn under by March 22, when hairy vetch had made about half as much growth. Nine winter legumes drilled about October 1 averaged 25 per cent more air-dry material than from November 1 plantings. Monantha vetch led many winter legumes in total yield of dry material grown by drilling 3 ft. apart about October 1 and November 1, and was followed in order by woolly-pod vetch, Oregon vetch, and Austrian Winter peas. April 1 harvests showed that woolly-pod vetch, Austrian Winter peas, Monantha vetch, Oregon vetch, and hairy vetch in order produced the most dry material from early October and November plantings.

The ranking of various winter legumes in relative earliness, based on the beginning of blooming, was Scotch vetch, narrow-leaved vetch (southern strain), bitter vetch, Monantha vetch, crimson clover, woolly-pod vetch, Tangier peas, Oregon vetch, hairy vetch, Austrian Winter peas, and purple vetch. From numerous analyses showing that green tops of hairy vetch contain 1 per cent of nitrogen, Monantha vetch 0.76, and Austrian Winter peas 0.79 it was recommended that hairy vetch be turned when the green tops from 100 sq. ft. weigh 12 lbs. and from Austrian Winter peas and Monantha vetch 14 lbs. Although not consistent seed producers, Monantha vetch, Austrian Winter peas, and Tangier peas made the largest seed yields in the variety test of winter legumes.

Drilled winter legumes proving hardy at the station against all low temperatures during the past 6 years included the hairy, Hungarian, and woolly-pod vetches, Austrian Winter peas, and narrow-leaved vetch (southern strain). Oregon vetch, crimson, red, alsike, and white clovers, black medic, Tifton bur clover, and Hubam and yellow biennial sweetclovers were killed or severely injured only once at a minimum temperature of 8° F. The same minimum temperatures that in some winters killed or severely injured a winter legume caused little or no injury to the same species in other winters. Austrian Winter peas, and Monantha and bitter vetches were most susceptible to aphis injury. Austrian Winter peas, hairy vetch, and woolly-pod vetch were damaged repeatedly by stem and leaf diseases, while Hungarian vetch and crimson clover escaped injury therefrom.

Fertilizer aids alfalfa on sandy soil, G. M. Grantham (*Michigan Sta. Quart. Bul., 12 1930), No. 4, pp. 150, 151*).—The large response to phosphorus and potassium by alfalfa on Fox sandy loam led the author to recommend the drilling of about 250 to 300 lbs. per acre of an 0–20–20 fertilizer before seeding alfalfa on the lighter soil types. Top-dressing old alfalfa stands with fertilizer has not been so effective as application before seeding.

Clover in the subirrigated meadows of the sand hills, E. M. Brouse (*Nebraska Sta. Bul. 241* (*1930*), *pp. 12, figs. 5*).—A study of meadow improvement by the use of red and alsike clovers was begun in 1923 at the Valentine Substation, and surveys were also made elsewhere in the sand hill region.

Numerous borings in clover meadows demonstrated that the water table during March, one year with another, is more nearly at the same level than at any other time of the season. Meadows with established clover stands were not found where the water table was more than 4 ft. below the surface during March. It was observed that in dry years clover was not seeded successfully where the water level was below a 2-ft. depth during March. The best stands and growths of clover seemed to be had on meadowland lying between 6 and 30 in. above the March water table. Meadows supporting a good sod of bluestem (*Andropogon furcatus*) and Indian grass (*Sorghastrum nutans*) will produce a good growth of clover, whereas meadows showing alkali grasses should be avoided.

Mammoth red clover seemed preferable to medium red clover. Alsike was about as drought resistant as red clover, and its longer life and greater winter hardiness made alsike especially valuable for the subirrigated mixed-hay meadows. March or April drilling of from 10 to 12 lbs. per acre of clover seed is advised on breaking or cultivated land, and from 6 to 10 lbs. of seed when broadcasted on native sod. Seedings of clovers have increased hay yields from 26 to 32 per cent. A seed mixture broadcasted on disked and on plowed meadow produced 175 and 205 per cent more hay, respectively, than on untilled meadow.

Feeding tests in which calves were more profitably wintered on mixed clover hay than on native hay have been noted (E. S. R., 59, p. 863).

Experiments with corn for corn borer control (*Indiana Sta. Rpt. 1929, pp. 16, 17*).—Some early varieties of corn, e. g., M. A. C. Yellow dent, Fulton Yellow dent, and Clement White Cap yellow, were found to produce yields which compared favorably with yields from the later varieties in common use. Indications were that for good yields early varieties should be planted thicker than is usual with varieties now commonly grown. Fertilizer tests indicated that proper fertilization may be an important factor in greatly hastening maturity and producing profitable yields of early corn varieties planted late enough to escape serious borer injury.

Planting rates for early varieties of corn, P. J. Olson (*North Dakota Sta. Circ. 43* (*1930*), *pp. 8, fig. 1*).—Spacing experiments with early corn varieties demonstrated that Howe Alberta flint should be planted in drills so that the stand will not be less than 1 plant every 6 in. in the row. Additional yield increases are possible under most conditions with rows closer together than 3.5 ft. The rate customary for larger varieties appeared adequate for such early corns as Gehu, Square Deal, Golden Dent, and Pioneer.

Cotton varieties, J. C. Overpeck and W. T. Conway (*New Mexico Sta. Bul. 181* (*1930*), *pp. 13*).—Varietal tests with cotton (E. S. R., 51, p. 138), continued during the period 1924–1929 showed Acala to excel in southern New Mexico, especially on soils of heavy texture. Lightning Express, Delfos, or similar cottons seemed to yield as much as or slightly more than Acala on sandy soils. The common strains of Acala did not seem to differ much, although Okra Leaf

Acala apparently was not promising. Information on cultural, irrigation, harvesting, and ginning practice is set forth briefly.

Development of cotton fibers in the Pima and Acala varieties, R. S. Hawkins and G. H. Serviss (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 11, pp. 1017–1029, figs. 16*).—The development of fibers (hairs) in Pima (American-Egyptian) and Acala (upland) cotton was studied by the Arizona Experiment Station on material collected at the Salt River Valley Farm at various times during the season of 1926.

The growth of the fiber was observed to begin at the time of flowering, irrespective of fertilization, and to proceed rapidly after fertilization but to cease within a few days in unfertilized bolls. The elongation of Acala fibers was completed 21 days after flowering in the series which had flowered July 13, August 3, and August 24, and 24 days after flowering in the series which flowered September 14. Pima cotton required 27 days for the elongation of the fibers in the first three series and 30 days for those in the September 14 series. It appeared that lower temperatures probably caused the prolongation of the time needed for completion of fiber length in the September 14 series of both varieties.

In both varieties the fibers made a daily increase in length of from $\frac{3}{32}$ to $\frac{1}{8}$ in. at the time of their most rapid growth. The maximum increase in fiber length took place about the twenty-first day after flowering in the Pima series and from the fifteenth to the eighteenth day in the Acala series.

Appreciable thickening of fiber walls did not begin until fiber elongation was almost completed. The rate of fiber wall thickening decreased, with one exception, in each successive series as the temperatures declined. Thickening of fiber walls was completed in the Pima fibers 54, 48, 60, and 78 days, respectively, after the flowering period in the July 13, August 3, August 24, and September 14 series, while the Acala cotton required 48, 54, 48, and 75 days for maximum fiber wall thickening in these series. In some instances fiber wall thickening was completed at the time of boll maturity and in others a few days before maturity.

The time of the season during which cotton fibers are developing appeared to affect the rate of fiber wall thickening greatly but not to influence appreciably the rate of fiber growth in length until late in the season. The prevailing temperatures seemed to contribute to the rate of fiber development and when lower than necessary for optimum plant growth to retard both fiber elongation and fiber wall thickening.

Small seed pieces reduce potato yields, E. J. Wheeler (*Michigan Sta. Quart. Bul., 12* (*1930*), *No. 4, pp. 129, 130*).—Size-of-seed tests with potatoes in 1928 and 1929, continuing earlier work (E. S. R., 60, p. 52), gave indications that the yield is increased as the size of the potato set is increased from 0.5 to 2 oz. Furthermore, large sets appeared to be a factor in reducing hollow heart in wet seasons favoring its development. It is recommended that growers cut seed potatoes 1.5 to 2 oz. in weight. The pieces should be cut square or blocky so that they will handle well in the planter and will not be so likely to rot or dry out in the soil.

European bindweed, A. L. Bakke (*Iowa Sta. Circ. 124* (*1930*), *pp. 12, figs. 3*).—European or field bindweed (*Convolvulus arvensis*) is described as generally distributed in Iowa but particularly abundant and troublesome in the northwestern part. Practical information is given on its characteristics, differences from wild morning-glory (*C. sepium*), measures for its control, and on chemical weed killers.

Experiments on the control of mustard, R. BISSEY and O. BUTLER (*New Hampshire Sta. Sci. Contrib. 25 (1930), pp. 124–135, figs. 4*).—This is a reprint of an article previously noted (E. S. R., 63, p. 233).

Weeds in the vicinity of elevators, L. H. PAMMEL and C. M. KING (*Iowa Sta. Circ. 123 (1930), pp. 4*).—A survey in 1928 of the weed flora in the vicinity of numerous elevators in Iowa showed that the weeds about elevators do not differ greatly from those of their several neighborhoods. Common weeds were those generally found. The general migration tendency of weeds also was indicated.

HORTICULTURE

Report of the horticulturist, E. P. SANDSTEN (*Colorado Sta. Rpt. 1929, pp. 39–64*).—The usual annual report (E. S. R., 61, p. 136), dealing largely with results of cultural and varietal tests with fruits and vegetables.

Transplanting Valencia onions was found desirable in northern Colorado, resulting in greatly increased yields. At Rocky Ford the difference between seeded and transplanted onions was not large, apparently not justifying the cost of transplanting. Onion breeding was continued at the main station, considerable progress being made in the development of pure lines of Valencia.

Crosses between the New York and Mignonette lettuces yielded seedlings showing various degrees of resistance to tipburn and of various colors. Fertilizer studies with head lettuce indicated that manure with crop rotation is the best and most economical practice. Irrigation studies with lettuce showed that heavy irrigation at the final stage of growth is disastrous, resulting in seed stalk formation and unsalable heads.

Bean plants saved from a badly wilted field were used as a foundation stock for the development of bacterial wilt resistant strains. Work in the development of pea varieties for the mountain districts progressed.

For apple trees at Austin yellow sweetclover and red clover proved the best crops for 2-year stands, with winter rye best for 1-year covers for both peaches and apples. Hubam clover was promising when a stand was secured. With winter protection, some of the vinifera grapes proved promising at Austin. Red sports of Delicious and Rome apple were also promising.

A study by R. V. Lott of the fruiting habit of the red raspberry indicated that the most efficient method of pruning the Cuthbert under the hill system of culture is to thin to 8 canes and to remove from 12 to 15 in. from the tips. The hedgerow system of culture is conceded better than the hill, since the yield per cane was found to be inversely proportional to the number of canes per hill. Yield per cane and weight per berry were significantly larger from canes of large diameter. Where red raspberries needed winter covering, the best time to uncover was just before the buds started to push out into fruiting shoots. Left beyond this stage the new shoots were often severely injured when uncovered. Where grapes needed winter protection the high renewal 3-wire system of training was found most desirable.

In cooperation with a canning firm progress was made in the selection of desirable strains of sweet corn. Some data are presented showing that the present strains of sweet corn used by canners are low in quality, as measured by the percentage of barren stalks and lack of uniformity.

From a collection of over 650 varieties of peas assembled from all over the world there were selected superior strains. A similar collection of garden beans was also assembled, and superior strains of Giant Stringless and Stringless Refugee were secured. Individual plant selections were carried out with certain varieties of beans. Work at Rocky Ford with onions, cantaloupes, broccoli, tobacco, cauliflower, and carrots is discussed, with data on yields and costs presented in tabular form.

[Horticultural investigations at the Idaho Station] (*Idaho Sta. Bul. 170 (1930), pp. 10, 22, 23*).—In again presenting the annual report (E. S. R., 61, p. 830) the statement is made that the use of heat with diluted hydrochloric acid appeared to be the most effective means of removing arsenical accumulations from fruit. Oil sprays increased the difficulty of removing residues.

The results of the long-continued apple breeding project showed that certain varieties are more prepotent than others in transmitting their characteristics. Ben Davis, for example, was more prepotent than Esopus in transmitting tree shape, carried factors for oblong and oblate fruits, was prepotent in transmitting skin color, did not carry yellow but did carry solid red and red striping, carried determiners for both small and large fruits, for inferior and desirable flesh texture, was more prepotent than Jonathan and Wagener in transmitting thick skin, tended to be dominant over Jonathan in flesh color, carried factors for a wide range of colors, contained sweetness as a recessive, and carried determiners for both good and poor quality. Leaf character transmission was also studied.

Results of studies of the causes of the cracking of sweet cherry fruits in the Lewiston district again showed no direct relationship between soil moisture content above the wilting point and cracking. A significant temporary influence of fruit turgor on the severity of cracking was noted.

Ammonium sulfate applied to prune trees in the Boise Valley in 1-, 2-, 4-, and 6-lb lots per tree again gave significant responses in growth and yield, but the 6-lb. treatment was no better than lesser amounts and promoted excessive growth.

[Horticultural investigations at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 53–57, 58, 66, 67, figs. 2*).—Again presenting (E. S. R., 61, p. 337) information on the results of soil management studies, it is reported that apple trees growing in grass and receiving nitrogen made as good terminal growth and approximately the same trunk circumference increment as did tilled trees, even though the sod trees were smaller, due to an earlier handicap from competing grasses. Analyses of samples of terminal, current, and 1-year wood showed higher soluble nitrogen in trees from the alfalfa plats and in those under clean cultivation with cover crop than in trees in bluegrass sod. Nitrate nitrogen was low or absent during the active growing season in soils under bluegrass. Nitrates were low or absent in soil under alfalfa sod in early September, 1928.

Grimes trees on Virginia Crab roots were larger than on any other of several stocks tested. After seven years little difference was noted in the size of own rooted, root grafted, and budded trees of McIntosh, Red Astrachan, and Fameuse. At 12 years of age lightly pruned Grimes trees were still more productive than severely pruned trees. Bad crotches were avoided on young apple trees by careful pruning.

Lightly pruned grapevines yielded better during the first three seasons than did severely pruned vines. Vines pruned to two buds at the beginning of the second year produced as well as those cut less severely.

Insulation of the apple cellar at the Moses Fell Annex Farm reduced the cost of refrigeration and maintained lower temperatures.

Strawberry yields were increased by the use of commercial fertilizers, but split applications were not consistently better than single applications. Ammonium sulfate applied in August, 1928, increased 1929 yields in three of four tests. The Aroma strawberry was found best for shipping from southern Indiana. The Mastadon proved promising as an autumn bearer.

Tomato ripening was not accelerated by the use of ethylene, and it did not seem to prevent or even delay the appearance of scald in apples. Grading work with canning tomatoes improved the quality of the manufactured product and increased the quantity of product that could be obtained from raw fruits. Grading work with onions continued to show advantages. Evidence was secured that early plowing, early planting, spraying, and fertilizers resulted in larger yields of better grade tomatoes. Tomato breeding yielded some promising new strains. Potato seed pieces with sprouts attached rotted less quickly than did those without sprouts.

Comparisons of spraying and dusting as means of protecting fruit trees indicated the need of further development of dusting before it can replace spraying.

Studies in tomato quality showed that the color which can be obtained in the raw product is better than the color of the tomato pulp, that ripeness has a great effect on pulp color, that differences in temperature affect color slightly, that addition of water reduces the color of the pulp, that sucrose, acetic acid, paprika, and carmine enhance color, and that small amounts of copper salts reduce color. Methods employed in canning factories influenced the color of the product obtained. Supplementary applications of nitrogen, phosphorus, and potassium to tomato plants in need of these elements markedly increased growth and the number of fruits.

Material progress was made in the selection of wilt-resistant asters developed from a single resistant Queen of the Market plant.

Working with tomato plants grown in quartz sand, it was found that unless manganese was supplied with the nutrient solution growth was not good. The nonmanganese plants and their fruit were lower in sugar than those receiving this element.

[Horticultural investigations at the Massachusetts Station] (*Massachusetts Sta. Bul. 260 (1930), pp. 333–335, 345, 346, 361, 365–369, 371–376*).—Working further with the onion (E. S. R., 61, p. 832), J. P. Jones and M. E. Snell report that over a 4-year period sulfate of potash and muriate of potash gave approximately the same yields per acre. Where tobacco is to follow onions, the sulfate is conceded the more desirable form of potash. Lime was found almost indispensable in onion growing on acid soils. The average of 4 years' results on the station farm showed an increase of 70 per cent in the yield of No. 1 onions due to liming. The beneficial effect of lime varied with the seasons, being greatest in years of the blast disease when liming, by hastening the bulbing process, materially increased yields. Large applications of superphosphate alone or in combination with lime gave some evidence that combining superphosphate and lime reduced the lime needs of the soil but that superphosphate alone did not give this result. It was found that onions could be grown satisfactorily at a soil reaction of pH 6, and if lime did not raise the reaction above this point little injury from root rot resulted to the succeeding tobacco crop. Using 2,500 lbs. per acre, it was found that for onions increasing the superphosphate without increasing the potash content was unprofitable. For example, a 4–12–4 mixture proved no better than a 4–8–4, but a 4–12–8 was materially more effective. A nitrogen content of 4 per cent was sufficient for the first application but was advantageously supplemented by later top-dressings. Evidence was secured that the nitrogen should be partly of organic and partly of inorganic nature. Noting a relation between the severity of blast injury and the thickness of the stand, an experiment was conducted on the rate of seeding and spacing and showed that 3.5 lbs. of seed per acre is too little and 6.8 lbs. too much. Rows 13 in. apart gave larger yields than did those 15 and 18 in. apart, with little difference in quality. It is concluded that with good seed from 4 to 5 lbs. per acre in 13-in. rows will give the best results. Only about 50 per cent of the seed sown actually produced plants that attained maturity.

Studies at the Cranberry Substation, East Wareham, included tests by H. J. Franklin of various insecticides. Attempts by W. H. Sawyer, jr., to control black-headed fireworm by spreading entomogenous fungi did not yield conclusive results. Franklin and N. E. Stevens determined that false blossom disease is transferred freely from diseased to healthy plants by leafhoppers, but no other insect was observed to function. Stevens failed to find any evidence that the thickness of the cuticle of the berry has any relation to varietal disease resistance. As determined by Sawyer, variations occur in the pH values of the foliage in different cranberry varieties, but no correlation was established between these variations and desirable characteristics.

Studies at the main station by F. W. Morse of the chemical changes occurring in the cranberry during ripening showed a considerable varietal range in dry matter, total sugar, and total acid. Light-colored berries contained the lowest percentages of sugar.

As determined by J. K. Shaw and J. S. Bailey, clearing a space about the trunks of apple trees materially reduced mouse injury. Certain of the East Malling clonal stocks were propagated by root cuttings. Shaw and A. P. French continued work in nursery tree certification, making considerable progress in sweet cherry identification. Bailey, using a freezing apparatus, studied the relative hardiness of fruit buds of different varieties of peach and found material variations. Shaw reports that no obvious differences appeared in the quality or quantity of fruit borne by trees pruned in varying degrees of severity. Some evidence was obtained by F. C. Sears and Shaw that heavy pruning of old bearing apple trees gave a slight but not consistent increase in the size of fruit.

Shaw found that applying nitrate of soda to trees in cultivation without fertilizer distinctly increased yields. Comparing a complete fertilizer with a mixture of phosphorus, potash, and calcium, it was found that the complete fertilizer gave the best results, but the increased growth of white clover on the other areas is expected ultimately to modify the situation. As high as 25 lbs. per tree of nitrate of soda was used without injury on 30-year-old Baldwin trees. A comparison by Shaw of cultivation and heavy mulching for apples and pears showed larger yields on the mulched areas, leading to the suggestion that heavy mulching may have practical value. Working under controlled conditions with trees grown in Wagner pots, Shaw again found that applying lime to potash plats gave material benefit, as measured in growth, more so than was obtained by adding nitrate of soda, indicating that an increase in soil nitrates is not the sole factor concerned. Working in an apple orchard set in 1915, Shaw found that trees receiving nitrogen have yielded somewhat better than those without nitrogen. Complete fertilizer did not give better colored fruit than did nitrogen alone, but in general there was a tendency for plats receiving nitrogen to yield poorer colored fruit than did the nonnitrogen trees. Varietal studies were continued by Shaw and O. C. Roberts.

Studies by R. A. Van Meter of the effect of soil nitrates on fruit bud formation in the strawberry showed but little difference between treatments, though there appeared to be a consistent benefit in favor of later applications. Sears, Roberts, et al. found that Early McIntosh and Macoun apples are of doubtful value as pollinizers for McIntosh, with the Cortland more satisfactory. The set of fruit of inclosed McIntosh trees was greatly increased by adding bouquets of other varieties along with the bees. Evidence was secured by Roberts that dusts are desirable for the later treatments of fruit trees because of the reduction in arsenical residues.

At the Market Garden Field Station, Waltham, V. A. Tiedjens divided 1-year-old asparagus roots into 2, 3, 4, and 5 parts and found that the size of the resulting roots compared in all cases very favorably with the whole roots and suggests that this method of propagation is feasible. There was a rather high and unexplained loss of plants in the quartered roots. The number of stalks per plant for the four lots was 6.2, 5.8, 6.1, and 5.5, respectively, as compared with 8.4 for uncut plants. Comparing 2-year, selected 1-year, and cull 1-year roots there were found material differences between the selected and culled stock. Attempts to take stem cuttings from 1- and 5-year plants led to little success, spears in particular proving unsatisfactory material, even when treated with disinfectants. Sodium thiocyanate proved of some value for stimulating the growth of dormant buds. Individual plant selection was carried out in the Martha and Mary Washington varieties and showed considerable variability in the selected lines. The Mary Washington stalks appeared less sturdy than those of the Martha variety. The average number of seeds per berry varied from 3 to 5 in the different selections, though a few berries were found with 7 and 8. The weight of 100 seeds ranged from 1.6 to 3.2 gm. Observations were made on the variation in seed size in the selected lines. One-year roots were in 1928 planted 2, 4, 6, and 8 in. deep, and the results showed in favor of shallow planting. Concerning the angle of crown growth, seed planted from 2 to 3 in. deep gave the best results.

Sweet corn breeding was continued with a study of the progeny of selfed seed. Some of the strains ripened earlier than the parent and were equal in size. Seed of the Bel-May lettuce was distributed for testing. Improvement work was conducted with beets, carrots, beans, and squash.

A new cucumber producing no pistillate flowers during the summer months and only an occasional pistillate flower in the winter was isolated and is being used in inheritance studies. That fertilizers may have a relation to the prevalence of bitter cucumbers was shown in 31 per cent of such on nonmanured plats as compared with 42 per cent on manured. There was no difference between the chemical fertilizer treatments. A slow rate of growth increased the percentage of bitter cucumbers, but no correlation was observed between the position on the vine and bitterness. Bottle-necked cucumbers had a 75 per cent chance of being bitter near the stem.

Fertilizing twenty-five kinds of vegetables, J. W. LLOYD and L. H. STRUBINGER (*Illinois Sta. Bul. 346* (*1930*), *pp. 301–320*, *figs. 2*).—A résumé of results obtained over a 6-year period with 25 kinds of vegetables grown under 19 different soil treatments. The data presented, chiefly in tabular form, showed that in most cases supplementing manure with limestone resulted in definite increases in yield, reaching in the case of spinach 48 per cent. In the case of early beets, celery, okra, parsley, salsify, and sweetpotatoes yields were less where limestone was used. Steamed bone meal added to manure and limestone increased the yield of early carrots 41 per cent, onions 36, kohlrabi 32, and leaf lettuce 29 per cent. Potassium in the form of sulfate added to the manure, limestone, and bone meal combination increased the yields of beets and spinach approximately 39 per cent. Manure alone gave material increases with practically all vegetables.

The use of cover crops to supplement manure and commercial fertilizers apparently reduced yields in more cases than it gave increases. Supplementing the combination of manure, limestone, and bone meal, cover crops were particularly harmful. However, the substitution of a complete commercial fertilizer (steamed bone meal, dried blood, and potassium sulfate) and cover crops for manure resulted in satisfactory yields in most cases. Where an incomplete fertilizer with cover crops was substituted for manure less favorable results were obtained. Ammonium sulfate used as a source of commercial nitrogen was not as beneficial as was nitrate of soda. The omission of commercial nitrogen from the fertilizer used with a cover crop as a substitute for manure reduced yields.

Used alone, the complete fertilizer produced larger yields than did manure alone in the case of half of the crops. The gain over manure was 39, 32, and 18 per cent, respectively, for turnips, early carrots, and eggplants. Dried poultry manure did not prove a good substitute for stable manure.

Concerning sources of phosphorus, superphosphate when applied with manure, limestone, and cover crops proved generally more effective than steamed bone meal or raw rock phosphate, notably in the case of cauliflower, wax beans, kohlrabi, radishes, and turnips. Superphosphate used with limestone and cover crops was again more effective with more crops than was any other source of phosphorus. Concerning potassium, spinach, early beets, salsify, parsley, and leaf lettuce were the most responsive crops. The yields of more crops appeared to be increased by potassium when this substance was used in connection with a cover crop.

Data on costs and returns are given.

Cabbage fertilizer experiments, A. B. Fite (*New Mexico Sta. Bul. 180* (*1930*), *pp. 28, figs. 5*).—A summary of the results of cabbage fertilizer experiments begun in 1922 and regularly discussed in the annual reports (E. S. R., 63, p. 443).

The soil utilized in the study is described by H. N. Watenpaugh as a Gila fine sandy to sandy silt loam of medium original fertility. The response to animal manures was outstanding and profitable not only in respect to total yields but also to size of heads and market returns. Cottonseed meal also gave good results but was too costly. Ammonium sulfate proved the most valuable chemical fertilizer utilized. Various factors, including insects and tree shading, which influenced the results are discussed, and the yields of the various plats year by year are presented in tabular form. The average percentages of increased yield over the control areas for the 8-year period were as follows: Sodium nitrate, 30.48; cottonseed meal, 54.3; ammonium sulfate, 43.46; gypsum, 11.82; manure, 46.25; manure, steamed bone, and potash, 56.45; manure and steamed bone, 53.07; manure and potash, 51.95; manure and sulfur, 54.67; and manure and gypsum, 44.65.

Cantaloupe production in Michigan, J. B. Edmond, A. B. Strand, and F. J. McNall (*Michigan Sta. Spec. Bul. 193* (*1930*), *pp. 51, figs. 21*).—A general discussion upon the growing and marketing of the cantaloupe, supplemented here and there with results of investigational work and data on pests and diseases.

Of five varieties tested for yield in 1927, the Hoodoo was the most productive in both early and total crop. Other varieties were tested in 1926. In respect to sugar content, weather conditions were observed to exert a profound influence. However, variety was also a factor, as shown in the fact that the Hearts of Gold variety had a higher total sugar content in a poor year than did Osage and Bender in a good year. A close relationship was observed between sugar content and the percentage of total solids. It is pointel out that numerous strains of the more important varieties exist, and the process of selection is discussed, with the suggestion that the entire plant and not a fruit be used as the basis of selective improvement.

Fertilizer studies during the period 1926–1928 indicated that commercial materials are highly profitable provided there is adequate organic matter in the soil. Commercial fertilizer of the 3–12–4 (N–P–K) formula was most effective when applied in the hill, 300 lbs. thus used being more beneficial than 600 lbs. broadcasted. Large applications, 600 lbs. per acre, were most profitably applied in two portions. Large quantities of manure applied in the hill proved harmful in a dry season and conversely most valuable in a wet season. Liming to the extent of promoting a neutral or slightly acid condition in the soil was beneficial.

Protectors placed over the young plants in the field proved distinctly helpful in 1926 tests with the Hoodoo variety. Shallow tillage, especially in the late part of the season, was more desirable than deep tillage because of the presence of feeding roots near the surface. Pollination experiments showed the desirability of having adequate bees present during the blooming season. Studying the relation of maturity to sugar content, it was observed in the Osage variety that sugar increased rapidly up to the full slip stage. Data on seasonal price fluctuations are presented and show a very important relation between quality of melons and returns. Spraying with Bordeaux mixture tended to keep the vines healthy, and although retarding maturity somewhat this was more than offset by the prolonged production and the maintenance of quality in the fruit.

Muskmelons, W. R. Beattie (*U. S. Dept. Agr., Farmers' Bul. 1468, rev. (1930), pp. II + 38, figs. 38*).—This revision (E. S. R., 55, p. 340) presents in the same manner general information for the grower. The material on insects was contributed by W. H. White and that on diseases by W. W. Gilbert.

The period of blossom bud differentiation in the Baldwin and McIntosh apples, E. J. Rasmussen (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 255–260, pls. 2, figs. 2; also New Hampshire Sta. Sci. Contrib. 26 (1930), pp. 255–260, pls. 2, figs. 2*).—Using as an indication of differentiation the thickening of the meristematic area, or the crown of the bud, the elevation of this area, with the concurrent advance of the fibrovascular and pith tissues, and working with buds taken from several trees of each variety, the author found that the first indication in 1928 of Baldwin and McIntosh differentiation occurred on August 7 and July 29, respectively. In 1929 fruit bud formation was first observed on July 19 and July 17 for the two varieties. The earlier differentiation in 1929 is associated with a prolonged drought, which stopped terminal growth early. Size and outward appearance were not found reliable indications of differentiation. A few buds in the differentiation stage were observed in the Baldwin as late as August 14 in 1928 and August 2 in 1929. In the McIntosh no early stages were found after August 9 in 1928 and July 17 in 1929.

Apple pollination investigations, A. E. Murneek, W. W. Yocum, and E. N. McCubbin (*Missouri Sta. Research Bul. 138 (1930), pp. 36, figs. 12*).—Analyzing the self-pollination results obtained in Missouri and other localities, the authors found marked discrepancies in results, except with those varieties which are strikingly self-unfruitful, such as the Stayman Winesap, and conclude therefore that all apple varieties are subject to marked fluctuations in self-fruitfulness. The various possible causes of unfruitfulness are discussed, together with their possible relations to the problem at hand, and the results of pollination studies at the station are presented.

Of the varieties Ben Davis, Delicious, Duchess, Gano, Grimes, Jonathan, King David, Maiden Blush, Rome, Wealthy, Yellow Transparent, Winesap, and York Imperial, used as ovule parents, none was found adequately self-fruitful. Tests of pollen parents showed Ben Davis, Jonathan, and Delicious to be outstandingly effective for other varieties, with Grimes and Gano also satisfactory in most cases. Records showed that the average blooming dates for most varieties grown in Missouri overlap sufficiently, the early-flowering Duchess and the late-flowering Rome, Ralls, and Ingram being, however, exceptions to this rule. Open pollination in most cases gave better sets of fruit than did controlled crosses, suggesting that some unknown factor or factors may be involved. Emasculation had no material influence on the set of fruit obtained in cross-pollinations. Detailed pruning in the spring markedly increased the percentage set of open-pollinated blooms, sometimes to the extent of two to three times that of the nonpruned trees.

Effect of certain hydrocarbon oils on respiration of foliage and dormant twigs of the apple, V. W. KELLEY *(Illinois Sta. Bul. 348 (1930), pp. 369–406, figs. 11)*.—Supplementing an earlier report (E. S. R., 58, p. 232), this paper covers more completely the results of a study of the effects of oils on the respiration of apple shoots and foliage. As plant material, the author used dormant shoots of Jonathan, Grimes, and Delicious and the foliage of vigorous young Grimes trees.

In general the effect of oil emulsions on dormant twigs depended largely upon the development of the buds when sprayed. Before the separation of the bud scales all the oils accelerated respiration, but when applied immediately after this stage but before the leaves had unfolded oils retarded respiration. The buds of the cuttings treated with any of the oils during the dormant season failed to grow. When treated at the delayed dormant stage growth was retarded, the light oils, however, having very little effect.

During the dormant stage viscosity affected respiration only in the case of the unsaturated oils, but in the delayed dormant stage respiration was affected by both saturated and unsaturated oils. On foliage the heavier oils affected respiration only at high humidities; the greater effect of the light oils was produced at high humidity. Saturation of the heavier oils, comparable to those used in sprays, was not important in either the dormant or delayed-dormant periods and was relatively unimportant in foliage applications. The age of the leaves was an important factor, the younger unsprayed leaves respiring more rapidly than older leaves and being more easily injured by oil.

Relative humidity during and following the use of oil sprays is conceded the most important single factor concerned in avoiding injury, visible oil injury to foliage being produced only at high humidities. In some cases the high humidity of the respiration chamber checked growth of unsprayed twigs almost as much as did oil, the saturated atmosphere apparently water-logging the tissues.

Oil injury was evident on foliage only when sprays were applied to the lower surfaces under conditions of high humidity. Oil injury was manifested in translucent areas appearing on the under surface from 3 to 4 hours after spraying. The severity of the injury was correlated with the age of the leaf and the length of exposure to high humidity. With short exposures the manifestations gradually disappeared, while on long exposures the tissues were more deeply injured, becoming brown.

The nature of the effect of a saturated atmosphere on respiration and tissue injury is undecided but believed due to water-logging rather than carbon dioxide accumulation, since the removal of the gas from the chamber did not reduce the injury. The oils penetrated the leaf in the form of emulsions, apparently starting to enter through the stomata soon after application. High humidity apparently facilitated the entrance of the oils.

Sour cherry fruiting, R. H. Roberts (*Wisconsin Sta. Bul. 415 (1930), pp. 28, figs. 28*).—Pointing out that many of the older Early Richmond and Montmorency cherry trees fruit poorly under Wisconsin conditions, the author asserts that this condition is not due to inadequate pollination but rather to poor terminal growth. Detailed studies of the Early Richmond variety showed much more blossom bud formation and consequently much less spurring on terminal growths of the same length on low than on high-yielding trees. There was evidently a high correlation between the type of growth and yield. Trees once lapsed into a poor fruiting condition were restored to productivity with difficulty. A terminal growth of from 7 to 8 in. was found essential for the maintenance of a satisfactory spur fruiting system. A difference was noted between the Montmorency and Early Richmond in that the former variety developed spurs on shorter terminal shoots. Montmorency spurs in bearing tended to form more new fruit buds than did Early Richmond spurs, the latter showing a biennial tendency. Montmorency buds were hardier than Early Richmond buds.

Tillage, pruning, and fertilization practices designed to keep cherry trees in a thrifty, productive condition are discussed, with emphasis that a consistent program maintained throughout the life of the tree is better than neglect followed by drastic restoration.

Berry cultivation in western Washington, H. D. Locklin (*Western Washington Sta. Bul. 16–W (1930), pp. 22, figs. 7*).—In presenting a general discussion of the cultural management of berry fruits in western Washington, data are included from an experiment which compared five systems of culture with red raspberries but which showed no significant differences in growth as measured by cane length, winterkilling, and leaf abscission in autumn. In respect to fruit, there was some evidence that extensive deep tillage reduced yields, while surface tillage was beneficial. A lack of plowing resulted in the earliest ripe berries. The differences were, however, not striking in any respect between the several treatments. Costs and returns under the five systems are discussed, and information on the care of the Evergreen blackberry, the loganberry, and the strawberry is also included.

Fertilizing the black raspberry, R. E. Marshall (*Michigan Sta. Quart. Bul., 12 (1930), No. 4, pp. 123–128, figs. 2*).—Yield records taken over a 3-year period in a fertilizer experiment begun in 1926 in a 2-year-old plantation of black raspberries located near Covert showed no great differences due to fertilizers, although there was some evidence that nitrogen applied in August, September, or early spring increased yields. The soil was, however, naturally fertile and culture was better than the average. Deducting the cost of fertilizer, the returns per acre, based on the average of the three years, were a little larger on certain of the nitrogen than on the check plats. Nitrogen apparently increased the yield of early ripe fruit, but, since the total yields were not so markedly influenced, the author deduces that high early-season yields were accompanied by low late-season yields. Berry size was largest in the second picking, and this is believed to account in part for the better prices secured at this stage.

The propagation of the highbush blueberry, V. corymbosum, S. Johnston (*Michigan Sta. Spec. Bul. 202 (1930), pp. 22, figs. 10*).—After meeting with entirely negative results in attempts to root cuttings in the greenhouse in winter, various outdoor frames, namely, cold, solar, box, and open, were tried during the growing season. Using German peat as a cultural medium, over 80 per cent of both hardwood and softwood cuttings rooted in the solar frame, with very good results in the box frame, which is recommended because of its lower cost and easier operation. Of four media, German peat, American peat, German peat and sand, and sand alone, much the better results were secured with both hardwood and softwood cuttings in the German peat. Varietal differences were noted in rooting capacity with but little difference in the case of hardwood cuttings, whether taken in February or in April. With softwood cuttings, approximately the middle of July proved the best time for taking cuttings. Only a small percentage of softwood cuttings taken in late August rooted. Several chemical treatments were tested as means of stimulating rooting but with no consistent or conspicuous results. Evidence was secured that moderately high temperature and aeration are important factors in the rooting process. Very high temperatures killed the cuttings. Seed taken from ripe berries and sown immediately in German peat grew readily, and the seedlings were successfully carried over in the greenhouse or in a cold pit.

The construction of the box frame is described.

Studies of the staminate inflorescence and pollen of Hicoria pecan, J. G. Woodroof (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 12*, *pp. 1059–1104*, *figs. 24*).—Following an earlier paper (E. S. R., 56, p. 142) by the author and N. C. Woodroof on the morphology of the pistillate flowers, this paper presents observations from the Georgia Experiment Station upon the structure and function of the staminate organs.

Catkin primordia were differentiated in lateral buds on new shoots throughout the growing season. No abnormalities were noted in the development of catkin primordia, individual flower primordia, or archesporial-cell or mother-cell stages, but did occur in all varieties studied during the reduction divisions. In a few cases there was a rather high percentage of defective pollen grains, but because of the general abundance of catkins the author deems it unlikely that pollen defects are limiting factors in pecan pollination, except in the case of isolated trees or varieties.

Dichogamy, on the other hand, is conceded a potential source of inadequate pollination. High humidity, which practically inhibits pollen shedding, and very dry weather, which shortens the period of receptivity of the stigmas, are also limiting factors. Practically all shedding occurred between 9 a. m. and sundown, and conditions most favorable for shedding (warm, sunny weather) were least favorable for pollinations (warm, dewy nights). In respect to longevity, pollen lived about as long as the stigmas were receptive. Pollen produced on vigorous trees or on trees with few catkins was slightly more viable than that from weaker trees or from trees bearing a heavy crop of catkins. The size of the nut crop of one year was found to influence the size of the crop of both staminate and pistillate flowers the succeeding year. Certain varieties possess the habit of bearing a medium crop of flowers and nuts every year.

The anatomical features of the various male organs are illustrated and described.

FORESTRY

Requirements of forest trees differ, R. H. Westveld (*Michigan Sta. Quart. Bul.*, *12* (*1930*), *No. 4*, *pp. 130–132*).—Observations in a virgin forest in Cass County of the extent to which various species occur in the different layers of the forest showed the tulip poplar, black walnut, white ash, and black cherry to constitute a group which maintains itself with difficulty in a close stand. Red and white oaks were less exacting in requirements, and the beech, sugar maple, and elm were very prominent in all parts of the stand, evidencing a strong capacity for competition. A virgin stand is considered to be ever changing, with more and more of the tolerant species present. To maintain the less tolerant species cutting is required.

Artificial versus natural replacement on blight-killed chestnut land, P. W. Stickel (*Jour. Forestry, 28 (1930), No. 4, pp. 572, 573*).—Comparing planted white pine with natural replacement on typical blight-killed chestnut land, the Northeastern Forest Experiment Station found that artificial replacement was quite successful. Measurements in three sample plats, (1) planted white pine released from competing hardwoods, (2) planted white pine not released, and (3) natural replacement, showed the best pine growth in the released area. On the natural replacement plat only about half the stand was made up of useful species.

Studies with conifer cones and seeds, I [trans. title], G. Vincent (*Sborn. Výzkumn. Úst. Zemědĕl. Českoslov. Répub. (Rec. Trav. Insts. Recherches Agron. Répub. Tchécoslov.), No. 50 (1930), pp. 114, pl. 1, figs. 25; Ger. abs., pp. 106–114*).—Grading Scotch pine seed to color, no differences were observed at the Forestry Institute, Brno, Czechoslovakia, in germination qualities the first season after harvest, but in the second year the dark seeds germinated more quickly and better than did the light colored seeds. No differences in percentage of protein, fat, or water contents were established between the two groups, although the light colored seeds averaged somewhat less in weight. Measurements taken monthly on seedlings grown in flower pots showed that dark seeds produced somewhat taller seedlings, with considerable individual variation.

Working with Norway spruce and white pine cones gathered in various places, it was found that in cones from a single tree the longer cones contained the larger percentage of well filled seeds; furthermore, the average weight of the filled seeds was less in the small cones. Dividing Norway spruce cones crosswise into sections it was observed that the top and bottom thirds contained the highest percentages of empty seeds; with Scotch pine the zone of best seed formation was nearer the base, and in silver fir the select zone was nearer the apex than was the case with Norway spruce.

Separating large and small cones into three divisions by weight, it was noted that in the large cones the middle third contained the heaviest seeds, while in the small cones the top third led. Concerning location on the tree, no essential differences were found between cones gathered from the top and other parts of Norway spruce and Scotch pine trees.

Why nurserymen prefer southern seeds, C. G. Bates (*Jour. Forestry, 28 (1930), No. 2, pp. 232, 233*).—The results at the end of the first year of a test conducted by the Lake States Forest Experiment Station at Cass Lake, Minn., upon Norway pine seeds obtained from several locations showed in favor of seed from warmer sources, not only in germination but also in heavier weight of the resulting seedlings. A direct correlation was observed between the weight of the seed planted and the weight of the seedlings.

[Report of the] department of forestry (*Indiana Sta. Rpt. 1929, pp. 46–49, figs. 4*).—Commenting briefly on the planting and care of windbreaks for the horticultural and poultry departments, on the care of a Christmas tree plantation, and on the operation of the forest nursery, it is reported that *Pinus palustris* and *Sequoia sempervirens* were failures in the nursery, that *P. lambertiana* and *Larix europaea* were of little value, but that *P. ponderosa*, *P. laricio*, *P. sylvestris*, *P. resinosa*, *P. strobus*, and *Picea excelsa* gave gratifying results. Fall seeding of white pine proved more desirable than spring seeding, giving approximately 100 per cent more seedlings.

The economics of forestry, W. E. Hiley (*Oxford: Clarendon Press, 1930, pp. XIV+256, figs. 18*).—Founded on lectures presented at Oxford University, this book is devoted chiefly to a discussion of timber resources and the economics of cultivation.

Profitable management of the young forest, F. B. Trenk (*Baltimore: Md. State Dept. Forestry, 1929, pp. 12, figs. 8*).—Popular information is presented.

How much does it cost to thin? J. L. Averell (*Jour. Forestry, 28 (1930), No. 4, pp. 573, 574*).—Studies by the Lake States Forest Experiment Station showed that the cost of thinning is equaled by the value of the thinnings at about 25 years in aspen and at about 40 to 45 years in mixed stands of Norway pine and jack pine. Below these ages thinnings are not economically justifiable, but may be advisable at early stages when the work can be done with heavy knives at small cost.

The farm woodlot in Michigan, A. K. Chittenden and P. W. Robbins (*Michigan Sta. Spec. Bul. 196 (1930), pp. 28, figs. 7*).—A general discussion upon the management of the farm woodlot, supported by various data upon the rates of growth, yield of various products, such as timber and maple sirup, and upon methods of measuring woodlots and logs. Tables showing the approximate weight of dry and green timber of several species, the average life of untreated fence posts of different species, and the Scribner and Doyle log rules are included.

DISEASES OF PLANTS

[Plant pathology studies] (*Idaho Sta. Bul. 170 (1930), pp. 10, 23, 24*).—High calcium carbonate contents ranging from 5 to 30 per cent were found in an orchard soil at Filer, but with little correlation with chlorosis. Small amounts of iron and manganese were present. Treating the soil with iron sulfate generally increased the water-soluble calcium and sulfate. No connection was established between the pH value 8.5 found in the soil and chlorosis. Studies of the sap showed no definite correlation between pH and chlorosis, but conductivity was consistently higher in the sap of chlorotic trees.

Roguing isolated fields and greenhouse indexing of certified Great Northern bean stocks proved effective in controlling bean mosaic in southern Idaho. Selection for resistance in the Great Northern variety gave promising results.

Sulfur dust applied at the rate of 25 lbs. per acre was effective in controlling clover mildew and materially increased the yield of clover seed.

For the control of covered smut of oats formalin was as effective as any of the organic mercury compounds. Copper carbonate dust again proved most effective in the control of stinking smut.

Bacterial wilt of alfalfa was found to be widespread in southern Idaho.

[Botanical studies at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 22–28, 68, figs. 5*).—Continuing cooperative studies in rust resistance (E. S. R., 61, p. 342), it was found that the resistance of Webster wheat to two of the physiologic forms of leaf rust is inherited as a simple dominant factor, and in breeding studies has been combined with the field resistance of several other varieties. Seedlings from crosses between winter and spring wheats yielded winter wheats combining the resistance of both parental types. Several selections from Fultz and Michigan Amber showed promise for leaf rust resistance. Crosses between bread wheats and varieties of emmer and durum yielded rust-resistant progeny. In relation to nutrition nitrogen tended to favor and potash and phosphorus to decrease rust, especially in certain varieties. Of 135 varieties of barley 18 were highly resistant to at least two physiologic forms of leaf rust. This resistance was successfully transferred to a number of other types.

The feteritas were highly susceptible to rust (*Puccinia purpurea*), and the milos very resistant.

Marked differences were noted in the varietal resistance of cereals to scab in the severe summer of 1928. The spring wheats, Illinois No. 1, Norka, Progress, and Resaca, were outstanding for resistance. Among barleys a strain of Chevalier proved the least susceptible to scab.

Strains of snapdragons selected for rust resistance proved promising both at the station and in California tests. In the Iris family at least two races of rust were found, *Iris fulva* being very susceptible to one and resistant to the other. Bearded Iris appeared immune to both races.

Apple blotch studies at Mitchell showed that infection occurred during 21 of 23 rainy periods from 1 to 10 weeks after petal fall, and that some infection occurred during 1 rain 5 days before petal fall. At La Fayette infection occurred during 25 rain periods between 4 days and 9½ weeks after petal fall. The period of incubation following infection was about 3 weeks.

The fungus causing sooty blotch was isolated and used successfully in inoculations. A surface rot (*Sporotrichum malorum*) was found on stored apples.

Three virus diseases capable of attacking tomatoes were found on Jimson weed and two in the potato. Potatoes grown from true seed did not contain these viruses. One of the viruses, B, was founl to be transmitted by garden nightshade, garden groundcherry, petunia, tobacco, and Jimson weed. Pepper, smooth groundcherry, horse nettle, sugar beet, cabbage, cauliflower, New Zealand spinach, parsley, celery, zinnia, and snapdragon did not transmit virus B. Reducing the number of copper lime dust treatments for tomatoes to four or five was followed by poor results. The discovery of a new bacterial spot disease of radish, turnip, and cabbage, which is also parasitic on tomatoes, suggests that certain cruciferous plants may be dangerous sources of infection to the tomato. This disease was transmitted with radish seed and was not entirely eliminated by surface disinfection.

Inbreeding of field and sweet corns was continued in an attempt to develop disease-resistant types. Comparisons of common sweet corns with hybrid recombinations showed the hybrids to excel in uniformity of ripening. Seed corn dust treatments failed in 1928 to exert any significant benefit in plant vigor or yields.

Physicochemical studies of viruses showed no development of streak disease in tomato plants inoculated with a combination of noninfectious filtrate from diseased plants which produced fern-leaf symptoms and the juice from potato tubers, but tomatoes inoculated with residues which contained the tomato mosaic principle and juices from potato tubers developed streak. Inoculation of tomatoes with the filtrate freed from the infectious mosaic principle produced the fern-leaf symptoms. Attempts to transfer by inoculation from these fern-leaf plants to healthy plants were not successful. Filtrates were heated for 2.5 hours at 126° C. without any reduction in activity. In some cases tomatoes which showed the fernlike symptoms as a result of inoculation with noninfectious filtrates outgrew these effects. Whether these toxic principles are produced only in the presence of mosaic virus was not established.

Department of botany (*Massachusetts Sta. Bul. 260 (1930), pp. 340–344*).—As in the preceding report (E. S. R., 61, p. 839), summary accounts are given of the results of investigations.

Tobacco diseases, W. L. Doran (pp. 340, 341).—In field experiments the pH values of soil in limed plats remained practically unchanged at about 6 during the past four years. Neither alfalfa nor timothy, grown two seasons on limed plats, resulted in significantly increased acidity over that obtained by continuous tobacco. Sulfuric and orthophosphoric acids applied together for two successive years and sulfur (400 lbs. per acre) were the most effective soil-acidifying treatments. Black root rot was suppressed in proportion to the effectiveness of the acidifying treatment. Yields on unlimed nonacidified plats with tobacco grown continuously were 28 per cent greater than on plats last limed in 1923. Acidification of the limed plats increased yields, especially in the case of sulfur (200 lbs. per acre) in 1926 and 1927 and when sulfuric and orthophosphoric acids were applied together.

Of various chemicals used for preventing black root rot and other soil-borne diseases of tobacco, acetic acid treatment proved best. Promising results were secured with pyroligneous acid, but monochloracetic acid was not effective. Whether H-ion concentration or some factor such as active aluminum is the basis of the inhibition of *Thielavia basicola* is questioned, the aluminum sulfate being about as effective as sulfur and sulfuric acid in acidifyng soil and suppressing rot.

Brown root rot of tobacco was most prevalent following timothy or alfalfa, usually reducing yield. Heavy applications of calcium nitrate to timothy sod reduced the severity of brown rot, and even increased growth much more when applied to brown rot soil than when applied to brown rot-free soil.

Control of diseases of greenhouse vegetables, E. F. Guba (pp. 341, 342).—Finding that the conidia of tomato leaf mold germinate at a relative humidity of 100 per cent, experiments in greenhouse management were carried on, producing evidence that proper management is a factor in control. Leaf infection was reduced about 70 per cent and yields increased about 18 per cent by good management.

Downy mildews of cucumber and lettuce, W. L. Doran (p. 342).—Mildew of cucumbers occurred as severely in fields in which cucumbers had not been grown for at least three years as in fields where diseased plants were present the preceding season. The rarity of lettuce mildew in the field in summer is attributed to the inhibiting effects of high temperature. No effect was noted of potassium and calcium on the susceptibility of greenhouse cucumbers to mildew. Pseudoperonospora of cucumbers and Bremia of lettuce were held alive for several weeks on detached cotyledons of the host plants floated in sucrose solutions.

Eradication of nematodes in greenhouse soils, L. H. Jones (pp. 342, 343).—The acetic acid with calcium cyanide treatment for nematodes, to be successful, should be applied twice at a 7-day interval. The acetic acid apparently acted as a carrier for the lethal cyanide, maintaining the gas in the soil for a longer period. Paradichlorobenzene was satisfactorily substituted for the acetic acid in the cyanide treatment, being most effective in a 1:1 ratio.

Eggplant wilt, E. F. Guba (p. 343).—Obtaining no control by the addition of chemicals to the soils or by the use of paper mulch, some indication was noted that high soil acidity reduces wilt.

Onion blast (p. 343).—No blast developed during the year, but it was observed by A. I. Bourne and W. L. Doran that copper-lime dusts were more harmful to onion plants than was Bordeaux mixture and that the number of applications of the latter and of milk of lime needs limiting. L. H. Jones found that growing onions under conditions of reduced light and high humidity tended to reduce root growth and produce tender tops, which, when exposed to hot sunshine and drying wind, were injured in a manner resembling blast.

Carnation blight, E. F. Guba (p. 343).—In toxicity tests with spores, naphthalene dusts proved the most effective of 12 substances tested. Calcium arsenate with fish oil and Bordeaux mixture with fish oil gave the best results in preventing infection. No advantage was obtained in using saponin as a spreader. In field tests Bordeaux mixture with calcium arsenate and fish oil was the most effective of 13 fungicides used, and copper-lime dust with calcium arsenate the least effective. Calcium arsenate alone or combined with lime sulfur injured plants.

Forcing gladiolus with the aid of artificial light, L. H. Jones (pp. 343, 344).—Realizing that the embryonic flowers of the gladiolus are formed a few weeks after the corm is planted (during the season of maximum daylight), favorable results were secured with the Crimson Glow variety by lengthening the day in late fall and early winter. Added light in January increased the number of spikes by 63 per cent and the average number of blooms per spike by 30 per cent. Artificial light retarded the date of flowering by 15 days.

Influence of light quality on plant growth, A. V. Osmun (p. 344).—Radishes grown in a lean-to greenhouse under Vitaglass gained 71 per cent in weight of entire plant and 124 per cent in weight of roots as compared with radishes grown under ordinary glass. Lettuce gained 76 per cent in weight and headed better under Vitaglass, but consistent results were not obtained with calendulas and pansies.

The effect of pot structure on soil temperature, L. H. Jones (p. 344).—Standard 3-in. clay pots maintained a temperature as much as 20° F. below that of the air of the greenhouse on a hot day, while vitreous pots or glass vessels had only from 1 to 2° differential. Evaporation from the surface is deemed the underlying factor.

Effect on plants of cyanide fumigation following spraying with Bordeaux mixture, O. Butler and R. R. Jenkins (*Phytopathology, 20 (1930), No. 5, pp. 419–429, figs. 6; also New Hampshire Sta. Sci. Contrib. 27 (1930), pp. 419–429, figs. 6*).—At the New Hampshire Station it was observed that the formation of cupric cyanide in a Bordeaux mixture exposed to cyanide fumigation is determined by the ratio of copper sulfate to quicklime used in the mixture. Cupric cyanide did not form when this ratio was 1:0.2, and only in negligible amounts when the ratio was 1:4 or higher. In the 1:0.2 mixture insoluble cuprous cyanide was formed. In the 1:6 a soluble double cyanide was noted. In mixtures with ratios greater than 1:1 but less than 1:6 the amount of cupric cyanide formed decreased with an increase in calcium hydrate, and the double cyanide became more abundant. Bordeaux mixture which formed with hydrocyanic acid gas a double cyanide was found injurious if the sprayed and cyanided plants were wet. A neutral or approximately neutral Bordeaux mixture is recommended where sprayed plants are to be subjected to cyanide fumigation and should then be used only on plants no more sensitive to soluble copper than is the tomato.

Field studies on the rust resistance of oat varieties, M. N. Levine, E. C. Stakman, and T. R. Stanton (*U. S. Dept. Agr., Tech. Bul. 143 (1930), pp. 36, figs. 4*).—Based on uniform nursery tests over a period of years and at many experiment stations throughout the United States and eastern Canada, information is presented on the resistant properties of oat varieties to stem and crown rust, with some data on smut resistance. The rust scale developed by the Bureau of Plant Industry was used as a standard of measurement.

Although there were very pronounced differences in the quantity and quality of stem rust on several varieties at the various locations in the different years, Iogold, Hajira, Richland, Minota × White Tartar, White Tartar, Green Mountain, Anthony, and Edkin were conspicuously resistant, the average infection coefficients for the eight oats ranging from less than 0.5 to a little over 3 per cent. Concerning crown rust, the most resistant varieties were Green Mountain, Red Rustproof, Iowar, "Rustless Selection," Burt, and Ruakura. In general no correlation was observed between resistance to the two rusts, some varieties most resistant to stem rust being most susceptible to crown rust, and vice versa. Markton oats was the most susceptible to both rusts.

Rather incidental observations on the relation of variety to smut infection showed Markton, Red Rustproof, Fulghum, and Hajira to be very resistant to both smuts, with White Tartar, Green Mountain, and Anthony extremely susceptible. No correlation whatsoever was noted between rust and smut resistance.

Identification work conducted in the greenhouse at the University of Minnesota showed physiologic form 2 to be most prevalent. None of the virulent forms known to occur in other countries was definitely isolated. The general aspects of the rust control problem are discussed.

Symptomatology, transmission, infection and control of bean mosaic in Idaho, W. H. Pierce and C. W. Hungerford (*Idaho Sta. Research Bul. 7 (1929), pp. 37, figs. 14*).—The leaves of mosaic-infected plants usually showed a curled or distorted appearance with patches of lighter green interspersed amid the normal green. Varieties differed in their response to the disease, and the severity of the attack was influenced by other factors, such as health of the parent stock, temperature, light exposure, and fertility and moisture content of the soil. Great Northern bean plants infected during their growth produced seed which averaged 33 per cent mosaic when indexed in the greenhouse, while Great Northern plants grown from infected seed produced seed averaging 48 per cent mosaic. No correlation was established between the position of the seed in the pod and infection, nor was the size of the pod a factor.

Insect collections in diseased and healthy fields revealed the largest populations in the former. In artificial inoculations the highest percentage of infection was obtained with a combined leaf rubbing and maceration on young plants. Low temperatures tending to slow growth prolonged the incubation period and were not conducive to a high percentage of infection in artificially inoculated plants. Inoculated plants exposed to the continuous light of a 1,000-watt lamp in addition to normal daylight produced mosaic symptoms sooner than controls without supplementary light. As a practical conclusion, it is suggested that resistant varieties or strains constitute the most effective means of control, but where it is desirable to grow susceptible varieties partial control may be secured by consistent roguing.

Infection studies of Diplodia zeae (Schw.) Lev. and control of seedling blights of corn, W. P. Raleigh (*Iowa Sta. Research Bul. 124 (1930), pp. 93–121, figs. 11*).—Stating that the two most important symptoms of corn disease caused by the organism *D. zeae* are seedling blight and ear rot, the author reports the results of studies of the nature of the infections, factors affecting infection, and methods of control.

Infection of seedlings grown from Diplodia-infected seed usually occurred at the points of production of the secondary radicles. Diplodia-infected seed in 1925 and 1927 gave 4.5 and 1.3 times as many weak plants, respectively, as did nearly disease-free seed. Plants weakened by disease in the early stages often recovered fully if not competing with other plants. Fewer plants developed from Diplodia-infected seed at from 15 to 19° C. than from 20 to 24°. There was less visible seedling blight at the lower temperatures, due to the fact that the seedlings died before appearing. Artificial inoculation of ears was effected most readily in the milk stage.

None of the nine mercury disinfectants used in 1926 on nearly disease-free seed had any material effect on yield. Diplodia-infected seed, on the other hand, showed significant increases from treatments. In 1927 selected seed was improved in yield by treatment, and Diplodia and Basisporium-infected seed greatly benefited, showing that the results from treatments varied with seasons, with infection present at planting, and with other factors.

Effect of size of seed used in commercial planting on the incidence of leaf-roll and mosaic in potatoes, O. BUTLER (*Jour. Amer. Soc. Agron., 22 (1930), No. 1, pp. 75, 76; also New Hampshire Sta. Sci. Contrib. 24 (1930), pp. 75, 76*).—Records taken at the New Hampshire Station on the incidence of mosaic and leaf roll diseases in potato plants grown from large and small seed of the same stock gave no evidence that the percentage of mosaic and leaf roll developing in plants grown from certified seed of good quality is affected by the size of the seed stock.

Potato diseases in Oregon and their control, M. B. MCKAY and T. P. DYKSTRA (*Oregon Sta. Circ. 96 (1930), pp. 83, figs. 59*).—A general discussion.

Bacterial streak disease of sorghums, C. ELLIOTT (*Jour. Agr. Research [U. S.], 40 (1930), No. 11, pp. 963–976, pls. 2, figs. 4*).—Bacterial streak disease of sorghum is described as characterized by reddish-brown streaks on the leaves which appear water-soaked in the early stages and later may broaden at intervals into elongated oval spots with tan centers and narrow red margins. An exudate is formed abundantly and dries to form thin white to cream-colored scales. Experimental lesions were produced on the Dwarf White milo by spraying with cultures of the organism from lesions on the same variety and also from lesions on Johnson grass. A yellow polar-flagellate organism capable of reproducing the disease when sprayed on healthy plants was isolated from the lesions and given the name *Bacterium holcicola* n. sp. A technical description is presented, with notes on staining reactions, response to different culture media, etc.

Specimens of the disease were collected in Texas, Oklahoma, Kansas, and Montana. Some spread from younger to older leaves was observed, but, as a whole, the disease did not injure the plant sufficiently to necessitate control measures. It is believed that the disease spreads by seed or soil transmission.

Factors influencing the severity of the root rot troubles of sugar cane, H. H. FLOR (*Louisiana Stas. Bul. 212 (1930), pp. 40, figs. 10*).—Of various factors, variety senility, accumulation of toxic substances in the soil, nematodes, certain soil-inhabiting animals, and fungi, which may cause serious injury to sugarcane, the fungi are deemed the most important. No evidence was found that inorganic salts or soluble toxins are concerned in the root rot problem. The nematode *Heterodera radicicola* and a burrowing nematode similar to *Tylenchus similis* were found in sugarcane roots in small quantities. A root-pitting insect (*Lepidocyrtus violentus* Fols.) apparently increased injury in Pythium-infested soils, and a species of Rhizoctonia produced lesions on the roots but did no appreciable harm.

Species of Pythium are deemed the most important factor in reduced growth. Pythium injury to germination and growth increased with the water content of the soil and also with lowering of the temperature. At 35° C. Pythium did not injure corn, while at 30° there was appreciable injury. In culture Pythium was sensitive to acidity and tolerant to alkalinity, growing well in the pH range 5.5 to 9.2. The semiparasitic Pythium produced a cortex rot but did not enter the central cylinder, while the parasitic Pythium invaded all tissues and produced a soft rot. Pythium apparently entered young roots by disintegration of the epidermis and by force, spreading thereafter rapidly until reaching the walls of the central cylinder, where some resistance was met.

A chemical control of sweet potato scurf, R. F. Poole (*North Carolina Sta. Tech. Bul. 38 (1930), pp. 52, figs. 20*).—Sweetpotato scurf disease (*Monilochaetes infuscans*), widely distributed, occasions much economic loss by discoloring the periderm and causing shrinkage and desiccation. The casual organism produces a delicate hyaline mycelium that readily penetrates the periderm and produces short and club-like or sclerotial mycelium intracellular in the periderm and heavy mycelium on the surface. The sporophores are perpendicular to the surface of the infected tissue and prolific of hyaline spores in chains. The fungus, easily entering the periderm through the broken cell walls, advances into other cells as the outer parts of the periderm are sloughed off. Diseased potatoes and plants are major sources and the soil a minor source of infection. The fungus spreads throughout the root system, and spores wash downward from the infected stems. Growth was strong on extract media from manure, hay, and many plant products, suggesting a saprophytic tendency in the absence of the sweetpotato.

Studies with disinfectants showed a large number capable of inhibiting growth of the fungus in pure culture, but with diseased potatoes mercury compounds gave only partial control, and many others, including formaldehyde, gave no control. A 1–1,000 mercuric chloride treatment for 15 minutes and a 10 per cent hydroxymercurichlorophenol solution gave the best control.

Finding growth of the fungus to be inhibited at pH 3 and very weak between pH 3.5 and 4, the author developed a treatment in which sulfur was applied as a dust to plants and roots just prior to planting, creating an acid environment which prevented further spread. A 10 per cent hydroxymercurichlorophenol with 90 per cent inert material also gave practical control. None of the treatments had any effect on yield and were useful only in scurf control. Disease-free plants were obtained by vine cuttings.

Diseases of sweet potatoes in Florida, G. F. Weber and E. West (*Florida Sta. Bul. 212 (1930), pp. 40, figs. 24*).—A general discussion of the nature and control of various diseases.

Electrophoresis of tobacco mosaic virus, W. N. Takahashi and T. E. Rawlins (*Hilgardia [California Sta.], 4 (1930), No. 15, pp. 441–463*).—Using a Todd U tube electrophoresis apparatus and a plant extract containing tobacco mosaic virus, the authors obtained a behavior very similar to that of bacteria and chemically inert particles, the only difference being that the virus did not migrate to the cathode at pH values below 3. It is considered likely that the virus may have carried a weak positive charge at certain of the pH values at which it appeared to be isoelectric, but that the rate of migration was too slow to be detected. In these experiments migration to the anode occurred during electrophoresis between pH 4 and pH 9, with no migration noted between pH 3 and pH 1.2.

Spraying materials and the control of apple scab, W. C. Dutton (*Michigan Sta. Spec. Bul. 203 (1930), pp. 32*).—Stating that two materials, lime sulfur and Bordeaux mixture, may be depended on to give satisfactory control of scab but that both may cause russeting of fruit and the lime sulfur also foliage injury, the author reports the results of tests of various new materials and modifications of old.

Several proprietary sulfur sprays did not give consistently satisfactory control of apple scab. Dry mix sulfur lime and wettable sulfurs were found much less effective than lime sulfur in controlling apple scab. Substitution of these substances for lime sulfur in the after-blossom applications was followed by serious results in several cases.

Dry lime sulfur and liquid lime sulfur used on the basis of 4 lbs. of the dry being equal to 1 gal. of the liquid gave generally similar results, but occasionally more than 4 lbs. of the dry material was required to equal 1 gal. of the liquid. Lime added to liquid and dry lime sulfur did not increase the fungicidal value of the spray and in some cases had a decreasing effect. Casein spreader, 2.5 gal. to 100 gal. of spray, did not increase effectiveness. Calcium sulfate and tobacco dust added to lime sulfur spray did not influence scab control, and inconclusive results were secured with added sugar. Iron sulfate, 0.5 lb. per each gallon of lime sulfur concentrate, had no significant effect on scab control, although there was a slight lowering in fungicidal value in some cases. Aluminum sulfate was not satisfactory when combined with lime sulfur and lead arsenate.

Bordeaux mixture of low concentration usually gave satisfactory scab control, but was not equal to lime sulfur. Bordeaux mixture concentrations greater than 2–2–100 are deemed necessary to insure scab control. Adding lead arsenate to lime sulfur increased its effectiveness as a scabicide. Calcium arsenate was not found of any definite value as a fungicide.

As practical deductions the author advises that the omission of lime sulfur in the after-blossom sprays is often hazardous and that selection of the optimum concentration of lime sulfur or dry lime sulfur can not be standardized, but must be determined by each grower under his conditions. As a basis of safety 2.5 gal. of liquid lime sulfur with water to make 100 gal. or an equivalent amount of dry lime sulfur is suggested.

Souring of figs by yeasts and the transmission of the disease by insects, P. D. Caldis (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 11, pp. 1031–1051, figs. 7*).—Describing a destructive fermentation of both caprified and parthenocarpic figs and commenting on its economic importance and geographical distribution, the author reports that three different types of yeast, a top, a bottom, and a round yeast, were isolated from fermenting figs, and each is discussed in relation to cultural characteristics, fermentation ability, morphology, and pathogenicity. By introducing sterile anl infected dried-fruit beetles (*Carpophilus hemipterus* L.) into sacks containing figs, it was established that the beetles are able to enter the figs readily and produce fermentation if themselves infected. Transmission was found to be both internally and externally mechanical.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Calculating waterfowl abundance on the basis of banding returns, F. C. Lincoln (*U. S. Dept. Agr. Circ. 118* (*1930*), *pp. 4, fig. 1*).—A preliminary account of a proposed method for calculating the abundance of waterfowl.

A theory of tracheal respiration in insects, V. B. Wigglesworth (*Roy. Soc.* [*London*], *Proc., Ser. B, 106* (*1930*), *No. B 743, pp. 229–250, figs. 10*).—A theory of tracheal respiration is advanced by the author which will provide for the increased demands for oxygen that arise locally in active tissues. The account is accompanied by a list of 15 references to the literature.

The insecticidal action of some derivatives of pyridine and pyrrolidine and of some aliphatic amines, C. H. Richardson and H. H. Shepard (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 11, pp. 1007–1015*).—In the course of a study made of the relative toxicity of various nitrogenous organic compounds when used as contact insecticides, metanicotine and nicotyrine were the only substances tested which show a toxicity approaching that of nicotine. The relation of chemical structure to toxicity, particularly hydrogenation and methylation of certain groups, is briefly considered. Benzylpyridine gives some promise as an insecticide for special uses where its oily properties are advantageous, but where an ordinary cheap oil is not suitable.

[Report of work in entomology at the Idaho Station] (*Idaho Sta. Bul. 170* (*1930*), *pp. 20, 21*).—Further work with the beet leafhopper (E. S. R., 61, p. 848) indicates that there are three generations in southwestern Idaho. In work with a destructive prune worm, *Mineola scitulella*, 10 per cent of the larvae were found to be parasitized by six different species of Hymenoptera. Neither dormant nor delayed dormant sprays controlled the pest, but nicotine sulfate (1: 800) combined with dilute oil emulsion was effective in killing larvae soon after emergence from hibernacula, although increasingly less effective as the season advanced.

In the western oil spray cooperative work in which a comparison was made of lead arsenate alone and in combination with oil the combination produced 15 per cent more sound apples as a two-year average than did lead arsenate alone. Oil alone proved ineffective in codling moth control, while an oil nicotine combination following early cover sprays of lead arsenate produced a high degree of control with low residue. Apple trees that were sprayed with 6 per cent oil in midwinter showed no injury, but those sprayed after growth started were injured. The experiments indicate that oil of 50 to 70 sulfonation test can be safely used for dormant spraying, but oils for summer spraying should have a sulfonation test of no less than 85 with a viscosity of from 65 to 75.

[Report of entomological work at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 36–42, 57, figs. 6*).—The progress of work conducted with the codling moth, oriental fruit moth, European corn borer, and miscellaneous insects is briefly noted. In work with various banding materials and chemicals that automatically kill the codling moth, 97 per cent of the cocooning larvae were found to be thus destroyed. It appears, however, that some 20 per cent are repelled by the chemically treated bands thus far tested. Infested twigs were introduced from New Jersey from which some 600 individuals of the oriental fruit moth parasite *Macrocentrus ancylivora* were reared and released during the year in a heavily infested orchard at Vincennes. Studies made in the laboratory of the reaction of the European corn borer moths to odors resulted in controls ranging from 14 to 79 per cent.

[Report of the department of entomology at the Massachusetts Station] (*Massachusetts Sta. Bul. 260* (*1930*), *pp. 348–351*).—In European red mite control work conducted by H. T. Fernald and A. I. Bourne with a combination of certain types of oil sprays and sulfur or copper fungicides, it was found that they could be thus used safely and without impairing the insecticidal value. Against a moderate infestation of red mite almost all of the oils tested gave satisfactory control, indicating that in general, under such conditions, thoroughness of application and proper timing are more essential than the mere choice of oil spray. Preliminary tests of a recently developed sulfonated, oxidized oil spray have shown that a dilution of from 0.5 to 1 per cent, when combined with nicotine sulfate, gives satisfactory control of some species in concentrations of nicotine much lower than those at present recommended.

According to Bourne, the introduction by some growers of lady beetles from a western State in combating the onion thrips failed of any conspicuous success. Field tests demonstrated the nicotine-soap combination to be an effective killing agent against thrips and the machinery for application to be practicable.

Laboratory poison experiments with the plum curculio on apples by W. D. Whitcomb again (E. S. R., 61, p. 849) indicated that lead arsenate at the rate of 2 lbs. in 50 gal. of water is the minimum dose to be used, and that calcium arsenate is superior to lead arsenate in equal units by weight. Fish oil sticker again increased the effectiveness of the poison, but less than in previous years. Curculios were attracted to and fed freely on dried fruit baits when kept in confinement, but in preliminary trials dried fruit baits in the orchard failed to control them.

Compared with the two preceding years the rainfall in 1929 during the period between the calyx spray and harvest is reported by Bourne to have been relatively insignificant. As a result, sprays could not be applied after early summer with any assurance of residue being removed. Even late summer applications of sulfur-lead dusts were made without encountering any difficulty with the residue.

In work by Whitcomb with the carrot rust fly (E. S. R., 61, p. 849) adults emerged from 92 per cent of the pupae confined in slightly moist sand and loam and from 80 per cent of those in moist sand and loam, but from only 50 and 33 per cent of those in wet loam and dry sand, respectively. In preliminary studies made of potted carrots grown from seed treated with mercury compounds, those dusted with calomel on the soil as well as on the seed were 35 per cent less injured than plants from untreated seed. Plants from Semesan treated seed showed very little infestation. The use of mulch paper effectively checked the first generation infestation, but the second generation damage was from 5 to 17 per cent greater under the paper.

Insect pests and their control in South Africa, C. K. Bain (*Cape Town: Nasionale Pers Beperk, 1929, pp. XII+468+VIII, figs. 204*).—Following a chapter on insects and their nearest relatives, those occurring in South Africa of economic importance are considered by orders, followed by chapters on beekeeping, diseases transmitted by insects and ticks, and control measures.

Controlling pests of tree fruits and grapes on Long Island, F. C. Deitz (*Farmingdale, N. Y.: State Inst. Appl. Agr., 1929, pp. 36, figs. 41*).—This is a practical account.

Insect pests of trees and gardens, J. A. Munro and H. W. Riddle (*North Dakota Sta. Circ. 42 (1930), pp. 56, figs. 46*).—A practical summary of information on the more important insect enemies of trees and gardens in North Dakota.

Greenhouse pests, C. C. Compton (*Ill. Nat. Hist. Survey, Ent. Ser. Circ. 12 (1930), pp. 112, figs. 34*).—This is described as a manual of practice in the control of insects and other pests attacking ornamental plants and flowers grown under glass in Illinois.

Wood-boring insects which attack furniture and buildings, E. I. McDaniel (*Michigan Sta. Circ. 134 (1930), pp. 12, figs. 10*).—In this account the author deals in a practical way with termites or white ants (*Leucotermes flavipes*), carpenter ant (*Camponotus herculeanus* var. *pennsylvanicus*), and powder post beetles (*Lyctus planicollis, L. linearis,* and *L. apacules*), and means for their control.

[Linopodes antennaepes Banks, a mite on mushrooms], O. E. Gahm (*Jour. Wash. Acad. Sci., 20 (1930), No. 8, pp. 155, 156*).—A note is presented on the occurrence and distribution of *L. antennaepes*, a pest of cultivated mushrooms never before recorded. This mite was found infesting mushroom houses in Pennsylvania in March, 1929, the injury being characterized by destruction of the root system and by a decided constriction at the base of the stalk or stipe. The root system is often so completely devoured that the mushroom is held to the surface of the bed by only a few withered filaments.

Bionomics of Kalotermes tectonae Damm. as a base for its control, L. G. E. Kalshoven (*De Biologie van de Djatitermiet (Kalotermes tectonae Damm.) in Verband met Zijn Bestrijding. Proefschr., Landb. Hoogesch.,* *Wageningen, 1930, pp. XI+154+[2], pls. [22], figs. 12; Eng. abs., pp. 120–127, 153, 154)*.—This is a report of studies of the biology of *K. tectonae* as related to its control, commenced in 1925, many of the details of which are presented in tabular and chart form. A list of 54 references to the literature is included.

The citrus red scale (Chrysomphalus aurantii).—Progress report on fumigation and spraying experiments, A. R. Woodhill (*Agr. Gaz. N. S. Wales, 41 (1930), No. 2, pp. 125–130*).—A brief summary is given of work under way in New South Wales in 1927, 1928, and 1929, including the methods employed and results obtained. An earlier account of fumigation experiments by Arthur and Harrison has been noted (E. S. R., 55, p. 658).

Lime sulphur in relation to San Jose and oyster shell scales (Studies of contact insecticides, II), W. C. O'Kane and J. G. Conklin (*New Hampshire Sta. Tech. Bul. 40 (1930), pp. 15, figs. 8*).—The work reported, conducted in continuation of that previously noted (E. S. R., 63, p. 154), deals with the physical properties of lime sulfur, its chemical performance when applied as a spray, and the relation of these factors to toxicity. The work conducted has been summarized as follows:

"Lime-sulfur sprays were able to effect good wetting of the bark of apple, plum, poplar, and sour cherry, and excellent wetting of black currant. The same sprays gave only a moderate angle of contact on the covering of San Jose scale and oyster shell scale. The angle of contact on the exposed integument of San Jose scale was high. The angle of contact and degree of wetting of lime sulfur were approximately the same as those of distilled water. Lime-sulfur sprays were not found to penetrate the waxy scale covering. Only in rare instances did the sprays creep beneath the margin of the scale. The surface tension of lime-sulfur solutions is approximately the same as that of distilled water. It is not appreciably altered when exposed to the atmosphere.

"Lime-sulfur solutions remained distinctly alkaline for 18 to 24 hours. Hydrogen sulfide is evolved from lime-sulfur solutions for a few hours after application of the sprays. Evolution practically ceases within 6 hours. Hydrogen sulfide in the amount evolved from lime-sulfur sprays can not be considered as sufficient to account for their toxic action on San Jose scale or oyster shell scale. Young oyster shell scale withstood higher concentrations than could be liberated from lime-sulfur sprays as applied to trees. No trace of sulfur dioxide was found. Chemical tests gave no indication of the presence of sulfides in the bodies of scale insects exposed to the vapors of lime sulfur, but the significance of this is questioned."

Transmission studies with the new psyllid-yellows disease of solanaceous plants, A. M. Binkley (*Science, 70 (1929), No. 1825, p. 615*).—The common tomato psyllid (*Paratrioza cockerelli* Sulc.) has been found to transmit a destructive disease of potatoes occurring on the western slope of Colorado. Viruliferous nymphs of this psyllid transferred the disease from affected to healthy potato plants, the characteristic symptoms appearing within from 7 to 10 days. The disease has been transmitted from diseased tomato to healthy potato plants and from potato to tomato plants. It has also been transmitted to the common garden pepper, to eggplant, and to the ornamental Jerusalem-cherry.

The banana aphid (Pentalonia nigronervosa Coq.), E. H. Zeck and H. W. Eastwood (*Agr. Gaz. N. S. Wales, 40 (1929), No. 9, pp. 675–680, figs. 3*).—An account is given of an aphid which not only causes direct damage by sucking sap of the banana but has proved to be a carrier of the virus of "bunchy top" of Manila hemp (*Musa textilis*) in the Philippine Islands. Its known food plants throughout the world are *M. sapientium*, *M. banksii* (bananas), *M.*

textilis (Manila hemp), *Musa* spp., *Alpinia rafflesiana*, *A. speciosa*, *Arum maculatum*, *Strelitzia* sp., and *Ravenala* sp.

The apple leaf jassid (Typhlocyba australis Frogg.), N. S. Noble (*Agr. Gaz. N. S. Wales, 40 (1929), No. 9, pp. 681–691, figs. 2*).—Observations and experiments made at the Bathurst Experiment Farm are reported. *T. australis* first caused considerable damage in 1918 and has now been reported from all the chief apple-growing centers, but only to a limited extent in the northern parts of the State. Nicotine sulfate (1 part in 800 parts) plus hard soap 1 lb. to 50 gal. of spray, and nicotine sulfate (1 part in 800 parts) combined with lime sulfur (1 part in 35 parts) proved the safest and most effective sprays. Both white and red miscible oils also gave reasonable control, but the red oil caused some injury to the trees.

Some phases of the sugar-beet leafhopper problem, W. Carter (*Jour. Wash. Acad. Sci., 20 (1930), No. 8, pp. 153–155*).—A discussion of the problem presented at a meeting of the Washington Entomological Society held in January, 1930.

A Rickettsia-like microorganism in Eutettix tenellus (Baker), the carrier of curly top of sugar beets, O. Swezy and H. H. P. Severin (*Phytopathology, 20 (1930), No. 2, pp. 169–178, figs. 2*).—In cooperative work by the U. S. D. A. Bureau of Entomology and the California Experiment Station it has been found that the beet leafhopper harbors two different organisms, although these can not be separated on morphological grounds. The differences between the two organisms lie in the fact that one may be filtered and the other can not pass through the fine Berkefeld filters. The first is found in infective insects and the other in both infective and uninfective.

Lygus pratensis (L.), an enemy of Chrysanthemum and Verbascum culture [trans. title], J. Rozsypal (*Zentbl. Bakt.* [*etc.*], *2. Abt., 78 (1929), No. 1–7, pp. 143–149, figs. 5*).—This is a summary of information on the tarnished plant bug, presented in connection with a list of 42 references to the literature.

Field notes on the banana fruit-eating caterpillar (Tiracola plagiata Walk.), J. A. Weddell (*Queensland Agr. Jour., 33 (1930), No. 3, pp. 186–201, figs. 4*).—This is an account of a lepidopteran occurring in banana plantations, where it has been a source of injury to the fruit, banana growers having lost approximately one-third to one-half of the season's crop.

Studies of the anatomy and histology of the reproductive system of the female codling moth, Carpocapsa pomonella (Linn.), S. L. Allman (*Calif. Univ. Pubs. Ent., 5 (1930), No. 7, pp. 135–164, pls. 5, figs. 9*).—Results of a study of the reproductive system of the female codling moth are presented in connection with a list of 19 references to the literature.

Codling moth bandage clip, T. N. Powell (*Agr. Gaz. N. S. Wales, 41 (1930), No. 3, pp. 234–236, figs. 4*).—The author describes a simple clip that he has devised that will expedite bandage inspection and can be used by the orchardist at a very little cost. The clip does away with the nails, wire, and string, and simplifies the method of removing the bandage and resetting it.

The biology of the four-lined borer Luperina stipata (Morr.), G. C. Decker (*Iowa Sta. Research Bul. 125 (1930), pp. 125–164, figs. 22*).—A study was made of this native lepidopterous borer, which normally feeds upon slough grass (*Spartina michauxiana* Hitchs.), but occasionally causes considerable "dead heart" damage to corn.

The larva attacks its host in several different ways. On tender young plants the newly hatched larvae usually bore into the stem near the surface of the soil or crawl under the lowest leaf sheath and enter at that point. On larger and tougher plants they frequently climb up the plant and tunnel down into the "open heart." If the soil is loose or if there is a crevice in the ground near the plant, the borer frequently tunnels into the stem below the surface and just above the crown. Upon the death of their initial host, first, second, and third instar larvae may enter a second host by one of the above-mentioned ways. As the borers become older and larger the tendency to work below the surface of the soil prevails. Borers in the fourth and later instars invariably descend to the bottom of their burrows and then migrate underground to other plants. In this way a single borer sometimes destroys every plant in a hill of corn without coming to the surface of the soil. Corn is usually attacked by half-grown larvae migrating from wild host plants. After entering below the surface of the soil they bore upward through the heart and ultimately kill the plant. This mode of attack produces what is commonly known to the grower as dead heart. It is characterized by the central portion of the plant being dead while the outer leaves remain green and appear healthy.

There was found to be but one generation each year in Iowa. The overwintering eggs hatch during late April or early May, and the larvae develop and pupate in from 10 to 14 weeks. The moths emerge early in August and oviposit for the next year's brood.

Natural enemies were found to play an important part in checking the pest, 21 parasites and predators having been observed, representing 2 Diptera, 7 Hymenoptera, 4 Coleoptera, 3 Hemiptera, 2 mammals, and 3 diseases. Borers collected from slough grass were parasitized, but those taken from corn were free from parasites. Elimination of slough grass from fence rows and burning the heavily infested grasslands between November 1 and April 1 are recommended as means of control.

Parasitic control of the moth borer (*West Indies Imp. Dept. Agr., Antigua Agr. Dept. Rpt., 1928–29, p. 12*).—From 2.1 to 14.4 per cent of the moth borers were found to be attacked by Iprobracon parasites during the season 1928–29.

Life history of the oriental peach moth at Riverton, N. J., in relation to temperature, A. Peterson and G. J. Haeussler (*U. S. Dept. Agr., Tech. Bul. 183 (1930), pp. 38, figs. 22*).—This report upon work conducted is in continuation of accounts previously noted (E. S. R., 56, p. 258; 60, pp. 456, 560, 848). It was found in 1925 that there were five complete or partial generations and in 1926 four complete or partial generations. The marked difference in the temperature during the two seasons was chiefly responsible for the decided difference in the number of generations and the dates when the various stages in the several generations occurred. The season of 1926 was considerably cooler than the preceding season, and from May 1 to September 30, 1926, there were 333.3 effective day-degrees less than for the same period in 1925.

The obsevations of these two years indicate that as with the codling moth, as reported by Glenn in Illinois (E. S. R., 49, p. 54), the effective temperature for development ranges between 50 and 86° F. The variation in the number of effective day-degrees required to complete the development of each stage, namely, egg, larva, and cocoon, including pupa, did not exceed 1 per cent for the two seasons. The average accumulated effective day-degree requirement for the fall of 1926 was found to be consistently less (12 per cent or more) for all zeros of development than that for the fall of 1925. Conversely, the average effective day-degree requirement for the spring of 1927 was more than 12 per cent higher than that for the spring of 1926. Thus, in the case of wintering larvae the effective day-degrees in the fall of the year as well as those occurring in the spring must be taken into consideration in determining the spring brood emergence of moths. A temperature of 52° is probably the zero of development for the stages in the overwintering cocoon. Although the 50 to 86° range of effective day-degrees is approximately correct if all the individuals of a given stage for an entire growing season are taken into consideration, there is a slight difference in the generations when the effective day-degrees are ascertained for a given stage in the several generations. It is possible that the zero of development for the oriental fruit moth may be somewhat below 50° for some stages, particularly the feeding period and possibly the cocoon period of transforming individuals.

On certain semi-carnivorous anthomyid larvae, D. KEILIN and P. TATE (*Parasitology, 22 (1930), No. 2, pp. 168–181, pl. 1, figs. 5*).—The species here dealt with are *Ophyra leucostoma* Wied., *Polietes albolineata* Fallen, *P. lardaria* F., *Mesembrina meridiana* L., and *M. mystacea* L.

The occurrence of the larva of the sheep nasal bot fly (Oestrus ovis) in the trachea, M. K. GARUDACHAR (*Vet. Rec., 10 (1930), No. 15, pp. 329, 330*).—Attention is drawn to the unusual presence of larva of *O. ovis* in the trachea of sheep. No evidence could be obtained as to the exact stage at which the migration to the trachea took place. It is thought possible that some of the earlier stage larvae instead of passing to the frontal sinus might have entered the nasopharynx and passed posteriorly to the glottis, which they might have entered to reach the trachea.

The Hessian fly and how losses from it can be avoided, W. R. WALTON and C. M. PACKARD (*U. S. Dept. Agr., Farmers' Bul. 1627 (1930), pp. II+14, figs. 14*).—This is a revision of and supersedes Farmers' Bulletin 1083, previously noted (E. S. R., 43, p. 55).

Report of mosquito survey in St. Croix, T. H. HAYES (*U. S. Naval Med. Bul., 28 (1930), No. 1, pp. 194–222, fig. 1*).—A detailed account of a study of mosquitoes on the island of St. Croix, Virgin Islands.

The Asiatic beetle, a serious pest in lawns, H. C. HALLOCK (*U. S. Dept. Agr. Circ. 117 (1930), pp. 8, figs. 3*).—A practical summary of information on this pest, accidentally introduced from the Orient, a detailed account of which by Friend has been noted (E. S. R., 61, p. 555).

The biology of certain Coleoptera associated with bark beetles in western yellow pine, G. R. STRUBLE (*Calif. Univ. Pubs. Ent., 5 (1930), No. 6, pp. 105–134, figs. 6*).—The species studied and here reported upon are the histerid beetles *Platysoma punctigerum* Lec. and *Plegaderus nitidus* Horn, the tenebrionid *Hypophloeus substriatus* Lec., and the staphylinid *Nudobius pugetanus* Csy. A list of 38 references to the literature is included.

The bean leaf beetle, C. O. EDDY and W. C. NETTLES (*South Carolina Sta. Bul. 265 (1930), pp. 25, figs. 8*).—A summary of information on the bean leaf beetle in South Carolina, including observations of its life history, the details of which are presented in tabular form.

The emerged hibernated females were found to lay an average of 460 eggs, with extremes of 1,432 and 101 during a period averaging 65 days and with extremes of 120 and 13 days. The females of the first and second generations laid less than half as many eggs as the hibernated individuals. The average period of development was 11 days for the eggs (extremes of 16 and 9) and about 4½ to 7½ days for each of the three larval instars and the prepupal and pupal stages, with maximum periods of from 7 to 13 and minimum periods of from 1 to 5 days. The life cycle is completed in an average of about 40 days, with extremes of 54 and 35 days.

The tachinid parasite *Celatoria diabroticae* Shimer killed about 20 per cent of the adults, and a fungus disease destroyed a few adults in the field. As a control measure, the application of a spray consisting of magnesium arsenate

1 lb. to water 50 gal. or of a dust consisting of magnesium arsenate 1 lb. to 3 lbs. of hydrated lime is recommended.

The effect of light upon the development of the dark meal worm, Tenebrio obscurus Fab., R. T. Cotton (*Ent. Soc. Wash. Proc., 32 (1930), No. 4, pp. 58, 60*).—It is reported that by holding meal worm larvae at temperatures below normal they can be prevented from transforming at the regular period, and that by the use of light and warmth they can be induced to transform without passing through the normal hibernation period. It is pointed out that with the proper use of these three agents a supply of all stages of the dark meal worm can be obtained at all times of the year.

Synonymical and descriptive notes on parasitic Hymenoptera, A. B. Gahan (*U. S. Natl. Mus. Proc., 77 (1930), Art. 8, pp. 12*).—Species of economic importance here described as new include *Opius bellus*, reared from the West Indian fruit fly in the Panama Canal Zone; *O. lectoides*, reared from *Rhagoletis symphoricarpi* Curran in Corvallis, Oreg.; and *Horismenus depressus*, reared from *Bruchus pruininus* Horn in Alhambra, Calif. Record is also made of the rearing of *Copidosoma nanellae* Silv. from larvae of *Recurvaria thujaella* Kearf. collected in Maine and at Ithaca, N. Y., and *Rhabdepyris zeae* Wat. reared from *Tribolium confusum* in Indiana and Illinois, this species not hitherto having been recorded from America.

Mass production of egg parasites of the genus Trichogramma, S. E. Flanders (*Hilgardia* [*California Sta.*], *4 (1930)*, No. *16, pp. 465–501, figs. 17*).—This is a detailed account of the methods employed by the author in the production of *T. minutum* by use of the Angoumois grain moth and of utilizing it in the biological control of insect pests. It is considered probable that in the near future, with improved methods of rearing, the cost of producing this parasite will be reduced to less than $10 per million. Earlier accounts of this work by the author have been noted (E. S. R., 61, p. 256).

[Reports on work with bees at the Canada experimental stations] (*Canada Expt. Farms, Rpts. Supts., Agassiz (B. C.) Farm, 1927, p. 46; 1928, pp. 37–39; Beaverlodge (Alta.) Substa., 1927, pp. 62–64; 1928, pp. 61–65, fig. 1; Charlottetown (P. E. I.) Sta., 1928, pp. 53, 54; Fredericton (N. B.) Sta., 1927, pp. 60–66; 1928, pp. 50–55; Kapuskasing (Ont.) Sta., 1927, pp. 66–70; 1928, pp. 57, 58; Kentville (N. S.) Sta., 1928, pp. 59–61; Lacombe (Alta.) Sta., 1928, pp. 77–80; Lennoxville (Que.) Sta., 1927, pp. 71–74; 1928, pp. 63–65; Lethbridge (Alta.) Sta., 1927, pp. 46–50; 1928, pp. 60–66; Morden (Man.) Sta., 1928, pp. 59–70, figs. 2; Nappan (N. S.) Farm, 1927, pp. 57, 58; 1928, pp. 66–68; Rosthern (Sask.) Sta., 1927, pp. 55–58, figs. 2; 1928, pp. 43–46; Ste. Anne de la Pocatière (Que.) Sta., 1927, pp. 60–66; 1928, pp. 57–65; Scott (Sask.) Sta., 1927, pp. 69–73; 1928, pp. 62–64; Sidney (B. C.) Sta., 1928, p. 41; La Ferme (Que.) Sta., 1926–1927, p. 65*).—These reports continue previous work in beekeeping (E. S. R., 59, p. 659), and were prepared for Agassiz by W. H. Hicks; Beaverlodge, W. D. Albright; Charlottetown, J. A. Clark; Fredericton, C. F. Bailey; Kapuskasing, S. Ballantyne; Kentville, W. S. Blair; Lacombe, F. H. Reed; Lennoxville, J. A. McClary; Lethbridge, W. H. Fairfield; Morden, E. Braun; Nappan, W. W. Baird; Rosthern, W. A. Munro; Ste. Anne de la Pocatière, J. A. Ste. Marie; Scott, 1927, J. Matthews, 1928, G. D. Matthews; Sidney, E. M. Straight; and La Ferme, P. Fortier.

Apiculture, E. S. Archibald (*Canada Expt. Farms, Rpt. Dir. 1928–29, pp. 65–71, figs. 2*).—This is a report of work conducted at Ottawa relating to bees and pollination, Carniolan v. Italian bees, hives of different sizes, wintering surplus queens, and honey grading. It was found that with apple and plum trees insect visitors are essential for carrying out complete pollination. In the case of plums no set of fruit was obtained where honeybees or other insects were excluded from the trees, but good sets were obtained where honeybees or other insects were permitted to work the blossoms. The results of two years' work with black currants indicate that they are at least partially self-fertile, but that insects increased the set by their activities. The work at the branch stations is noted above.

Test to determine toxicity of pyrethrum vapors to honeybees, J. M. Ginsburg (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 11, pp. 1053–1057, fig. 1*).—In work conducted at the New Jersey Experiment Stations honeybees that were kept in chambers through which pyrethrum vapors were continuously circulated appeared normal at the end of 48 hours. They apparently were not affected by the volatile material emanating from the pyrethrum. The study has led to the conclusion that the toxicity of ground flowers, as well as extracts of pyrethrum, is due to the nonvolatile substances present; namely, pyrethrine I and pyrethrine II, while the essential oils do not in any way affect the insects.

A list is given of 19 references to the literature cited.

The biology of the tick Boophilus annulatus calcaratus Bir. [trans. title], W. L. Yakimoff, W. S. Belawine, E. F. Rastegaïeff and A. L. Schlüpikoff (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 36* (*1929*), *No. 3, pp. 137–152; abs. in Rev. Appl. Ent., 18* (*1930*), *Ser. B, No. 5, pp. 102, 103; Trop. Vet. Bul., 18* (*1930*), *No. 1, p. 13*).—This is an account of the biology of a tick which in Northern Caucasus transmits several blood parasites of cattle, namely, *Françaiella colchica*, the agent of red water, *Piroplasma bigeminum*, *Spirochaeta theileri*, and *Anaplasma rossicum*. The tick completes its life cycle in from 85 to 100 days. The first outbreaks of the disease occur in April and May. and the second commence in July.

ANIMAL PRODUCTION

[Animal nutrition studies at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 63, 64*).—Three experiments are briefly noted.

Vitamin A in relation to yellow pigments in corn.—Biological analyses have shown that the relative vitamin A content of yellow corn and a hybrid yellow containing about one-third as much yellow color characteristic was closely related to the amount of yellow pigment present.

Soybeans do not completely supplement the protein of corn.—The proteins of corn and soybeans did not produce optimum growth. The addition of meat scrap, tankage, or casein improved growth, while yeast had an additional accelerating action on growth. The exact nature of the action of yeast was not determined.

Mineral requirements for growing chicks.—It was found that in the absence of vitamin D in semipurified rations of chicks, the best results were obtained when steamed bone meal and oyster shell, in which the calcium-phosphorus ratio was 1:0.3–0.5, were fed. In such rations the best results, as indicated by blood analyses, were found when the ration contained not less than 1 per cent of phosphorus.

The comparative nutritive value of yellow corn and the grain sorghums hegari and yellow milo, M. C. Smith (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 12, pp. 1129–1145, figs. 12*).—In this study at the Arizona Experiment Station, albino rats of known nutritional history were placed on experimental rations at 28 or 29 days of age. The rations and distilled water were fed ad libitum, and weekly records made of the weights of animals and of food intake. One pair of young from the first litter of each female was continued on the diet of the mother.

A chemical analysis showed that the sorghums were higher in protein and lower in fat than corn. Rats fed hegari or milo as the sole source of nutriment did not grow normally or remain healthy over a normal life span. As the chief source of protein, hegari caused a subnormal rate of growth, delayed sexual maturity, and made reproduction highly unsuccessful. Hegari as the chief source of minerals failed to promote normal growth and reproduction and required a supplement of sodium, chlorine, and calcium to furnish adequate minerals. The amount of vitamin A in hegari was insufficient for normal growth, and animals dependent upon hegari for vitamin A showed a low degree of health and vigor, were quite susceptible to infection, and showed a marked failure in reproduction and ability to rear young.

The animals fed hegari properly supplemented with protein, mineral, and vitamin A were apparently normal in every respect.

A quantitative comparison of the vitamin-A content of yellow corn and the grain sorghums hegari and yellow milo, M. C. Smith (*Jour. Agr. Research* [*U. S.*], *40* (*1930*), *No. 12, pp. 1147–1153, figs 3*).—In studies with rats at the Arizona Experiment Station, it was found that yellow milo was twice as potent in vitamin A as hegari, and that yellow corn contained approximately 20 times as much vitamin A as hegari.

Commercial feeding stuffs, H. R. Kraybill et al. (*Indiana Sta. Circ. 170* (*1930*), *pp.* [2]+*38, fig. 1*).—This is a report of 2,761 samples of commercial feeding stuffs collected during the year 1929 and subjected either to microscopic examination or to a complete analysis. The inspection showed that 82 per cent of the samples were equal to or better than the manufacturer's guarantee and that 284 samples were seriously deficient (E. S. R., 62, p. 657).

Inspection of feeds, W. L. Adams and F. S. Schlenker (*Rhode Island Sta. Ann. Feed Circ., 1930, pp. 12*).—This is a summary of the guaranteed and found analyses for protein and fat of 221 samples of feeds collected for official inspection in 1929 (E. S. R., 61, p. 558).

[Experiments with beef cattle at the Colorado Station], G. E. Morton (*Colorado Sta. Rpt. 1929, p. 14*).—Results of three experiments are briefly reported.

Corn silage as a supplement to wet beet pulp.—In this study it was found that 75 tons of wet beet pulp when fed with grain, cottonseed cake, and hay were sufficient to finish only 35 head of calves, whereas the same amount of pulp supplemented with 43 tons of corn silage finished 66 head of calves. The latter ration, however, cost 64 cts. more per hundredweight of gain.

The fattening value of sugar beet tops.—When fed with a basal ration of barley, cottonseed cake, and alfalfa hay, beet tops had a feed replacement value of $6.41 per ton.

Summer cattle-fattening experiment.—Beef calves wintered on rations consisting largely of roughages made cheaper gains the following summer on a perennial grass mixture pasture than on alfalfa or sweet clover pasture. Feeding a protein concentrate to the calves on the perennial grass increased the return per head, but did not make a profit equal to that returned by calves finished in dry lot. Fattening cattle on irrigated pasture produced a characteristic yellow color in the carcass fat, which was partly corrected when a protein concentrate was fed.

Steer feeding [at the Caldwell Substation] (*Idaho Sta. Bul. 170* (*1930*), *p. 28*).—Continuing these studies (E. S. R., 61, p. 857), it was found that chopping and grinding alfalfa hay for fattening 2-year-old steers reduced the wastage and feed requirements of hay and increased the gains and finish of the steers. The ground hay was somewhat more efficient than the chopped hay. Adding 15 lbs. of cull potatoes to a ration of long alfalfa hay and barley increased the gains and decreased the feed requirements, but a larger allowance of potatoes tended to cause digestive disturbances. Corn silage added to long alfalfa hay and barley increased the gains and decreased the feed requirements. There was little difference in the steers fed corn silage and those fed cull potatoes except that the latter animals tended to scour. Replacing 16 per cent of the barley with cull beans produced fairly satisfactory gains and lowered the grain and hay requirements, but the animals did not seem to fatten. A limited allowance of cull beans had a laxative effect on the steers.

[Experiments with sheep at the Colorado Station], G. E. MORTON (*Colorado Sta. Rpt. 1929, pp. 16, 17*).—The results of two experiments are noted.

Comparative value of different kinds of molasses in lamb-fattening rations.—In a test with lambs fed a basal ration of shelled corn and alfalfa hay it was found that the palatability of cane molasses, beet molasses, Steffens discard molasses, and Johnstown Final Discard molasses was practically the same. The Steffens discard molasses was slightly more efficient than the others, followed in order of efficiency by beet molasses, Johnstown Final Discard, and cane molasses.

Winter maintenance of breeding ewes.—The addition of cottonseed meal to a ration of South Park hay appeared to be desirable on the basis of live weight of the ewes. Adding calcium or calcium and phosphorus to the ration showed no beneficial effect during gestation, parturition, or the early stages of lactation. However, as the lactation period progressed the ewes receiving minerals weighed more than those receiving none. There were indications that the heart girth and diameter of the cannon bone of lambs were larger when minerals were fed than when they were omitted from the ration.

[Experiments with sheep at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 18, 19, 20, figs. 2*).—The results of three studies are noted.

Legumes essential to rapid gains on lambs.—Lambs fed in a cornfield gained 3.41 lbs. per head, while similar lambs fed soybean hay in addition to the corn gained 9.24 lbs. In dry lot one feed of clover hay every fifth day for lambs on corn, cottonseed meal, and corn silage produced satisfactory gains. No great difference was found in the feeding value of clover and soybean hay.

Pasture efficient for lamb production.—More rapid and economical gains were made by both ewes and lambs on grass without grain than when fed a good ration in dry lot. Feeding grain to the lambs on grass increased the gains slightly. Turning the ewes on pasture and keeping the lambs in dry lot was more efficient than keeping both in dry lot, but less efficient than turning both on grass.

Best type of feeding lamb.—In this test Rambouillets, Corriedales, and Hampshire-Rambouillet and Hampshire-Corriedale crosses were compared in the feed lot. Lambs carrying Hampshire blood made the most rapid gains, while those carrying Corriedale blood attained the most satisfactory finish. When all factors were considered, the Hampshire-Corriedale cross was most satisfactory, but the advantage was not outstanding.

Pasturage and silage production for sheep, C. E. FLEMING, M. R. MILLER, and A. YOUNG (*Nevada Sta. Rpt. 1929, pp. 16–19, fig. 1*).—Over a period of 146 days, continuously grazed pasture produced 1,857 lbs. of increase in weight of lambs and 622 lbs. of ewe gain, while during 88 days of this period a rotated pasture of the same acreage and character produced 2,202.9 lbs. of gain in lamb weight and 1,489 lbs. of gain in ewe weight.

Preliminary studies have indicated that a single lamb nursing a ewe consumed as much grass during the grazing season as did a mature ewe. Twin lambs consumed as much as two nursing or two dry ewes.

Lamb feeding experiments (*Idaho Sta. Bul. 170 (1930), pp. 27, 28*).—Continuing these studies at the Aberdeen Substation (E. S. R., 61, p. 859), cull raw potatoes proved to be an excellent supplement to a ration of barley and hay for lambs. The cooking of the potatoes added to the cost of the ration, but did not increase the gains or the finish of the lambs.

At the Caldwell Substation chopping and grinding alfalfa hay for lambs reduced the wastage and the hay requirements. Grinding barley, however, showed no advantage over the whole grain. When cull beans replaced 20 per cent of the barley the gains were decreased and the feed requirements increased. Grinding the beans did not increase their efficiency.

Surface areas of sheep, E. G. Ritzman and N. F. Colovos (*New Hampshire Sta. Circ. 32 (1930), pp. 8*).—In an effort to compute the heat production to the basis of surface area, 60 mature sheep, 32 yearlings, 3 lambs 3 months of age, and 20 lambs from 9 to 45 days of age were measured. The equation $S=KW^r$, in which S equals the surface area for body weight W raised to the r power times the constant K, was used for the purpose of making available the means for presenting the measured heat production of small groups and of individual animals on the basis of surface area. The values for K and r were determined for all animals and also for each group of animals. The details of the study are given in tabular form.

Swine feeding investigations (*Idaho Sta. Bul. 170 (1930), p. 15*).—A lot of 10 pigs, averaging 51 lbs. initial weight per head, fed a limited ration of 15 parts of ground wheat and 1 part of tankage and on alfalfa pasture, made an average daily gain of 1.28 lbs. per head over a 94-day period. They required 338 lbs. of wheat and 22 lbs. of tankage per 100 lbs. of gain. A similar lot, full fed a ration of 13 parts of wheat and 1 part of tankage, gained 1.45 lbs. per head per day for 83 days and required 348 lbs. of wheat and 27 lbs. of tankage for each 100 lbs. of gain. While the latter lot cost more per unit of gain, they were ready for market 11 days earlier than those on the limited ration.

A lot of 8 fall pigs averaging 85 lbs. initial weight per head made an average daily gain of 1.08 lbs. per head for 98 days on a ration of 14 parts of ground barley and 6 parts of cracked Canadian field peas. They required 330 lbs. of barley and 142 lbs. of peas to produce 100 lbs. of gain. A similar lot on a ration of 14 parts of barley, 6 parts of peas, and about 1 part of ground alfalfa hay gained at the rate of 1.2 lbs. per head daily and required 306 lbs. of barley, 131 lbs. of peas, and 25 lbs. of alfalfa hay for each 100 lbs. of gain.

Three lots of 8 fall pigs each, averaging 80 lbs. initial weight per head, were fed for 84 days. Lot 1 on ground barley alone made an average daily gain of 0.84 lb. per head and required 580 lbs. of barley per 100 lbs. of gain. Lot 2 on 13 parts of barley and 1 part of tankage gained 1.3 lbs. per head daily and required 446 lbs. of barley and 34 lbs. of tankage per 100 lbs. of gain. Lot 3 on 15 parts of barley, 1 part of tankage, and about 1 part of alfalfa leaves made an average daily gain of 1.45 lbs. per head and required 430 lbs. of barley, 28 lbs. of tankage, and 20 lbs. of alfalfa leaves per 100 lbs. of gain.

[Experiments with swine at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 18, 19, 20, 21, 22, 68, 69, 70*).—Several experiments are noted, some of which are in continuation of those previously reported (E. S. R., 61, p. 363).

Soybeans vary in feeding value.—When grown in corn for hogging down, Dunfield and Manchu varieties of soybeans gave better results than Midwest, while in dry-lot feeding Midwest and Mammoth Yellow ranked first, Dunfield next, and Manchu last. In palatability the varieties ranked as follows: Mammoth Yellow, Dunfield, Midwest, and Manchu.

For fattening hogs on alfalfa pasture, whole soybeans were equal to ground soybeans. When supplemented with minerals and used as a supplement to corn, whole or ground soybeans were palatable and produced as economical gains as tankage.

Kelp a valuable mineral supplement.—As a supplement to corn and soybeans for fattening hogs, kelp was somewhat more efficient than a simple mineral mixture. It also improved rations of corn and tankage or corn and fish meal. For brood sows kelp gave best results when supplemented with a mineral mixture of limestone dust, special steamed bone meal, and salt.

Brood sows need minerals.—Adding a mineral mixture to a wintering ration of corn, oats, and tankage for brood sows gave good results. A mixture of limestone dust, special steamed bone meal, and salt was more efficient than the same mixture with dried kelp added.

Keeping sows and pigs in the farrowing house until the latter were 4 weeks old caused the development of many anemic pigs. More unthrifty pigs developed among those kept inside for 4 weeks than among those moved to individual houses at 1 week of age.

Percentage of wholesale cuts depends on thickness of fat.—Based on killing data obtained from 861 hogs, it was found that an increase in depth of fat from about 0.75 to 2 in. decreased the percentage of loin to total carcass 3.5 per cent, of ham 3 per cent, of picnics 2.25 per cent, of bony cuts 2 per cent, and of Boston butts and trimmings 1.5 per cent. At the same time there was an increase of 7 per cent in trimmed bacon bellies, 5.5 per cent in fat backs, 1 per cent in plate fat, and 0.25 per cent in dry salt butts.

Finish increases firmness of pork.—In this study it was found that as the depth of fat increased from 0.75 to 1.63 in. there was a decrease of 0.0009 in refractive index equivalent to two packers' grades for firmness. During this increase in finish the moisture of the fatty tissue decreased 3.5 per cent and the gelatin 1 per cent, while the fat in the tissue increased 5 per cent.

Mineral deficiencies of soybeans.—Tests have shown that the addition of casein and yeast corrected the mineral deficiencies of a ration of corn and soybeans for both hogs and rats and permitted the animals to make normal growth.

Anemia in swine.—In this study it was found that the addition of liver meal or wheat embryo or a combination of the two to the ration of a sow had no effect on the occurrence of anemia in pigs. Feeding liver extracts and wheat embryo extracts to pigs or dilute solutions of copper sulfate and manganese sulfate to sows and pigs also had no beneficial effect in preventing the occurrence of anemia.

Quality of pork.—A study of the effect of different methods of rendering fat tissues on the refractive index of the fat showed that rendering in open dishes in a hot air oven increased the refractive index, while rendering in test tubes where the exposed surface was reduced for short periods did not change the refractive index markedly. Autoclaving fat tissues for 8 hours at 15 lbs. pressure in sealed tubes did not change the refractive index of the fat.

Studies in swine feeding, I–III, W. E. J. Edwards (*Michigan Sta. Spec. Bul. 199 (1930), pp. 36, figs. 11*).—The results of three studies are reported in this publication.

I. *Feeding spring pigs on rape and alfalfa pasture.*—Concluding this study (E. S. R., 61, p. 459), it was found that practically identical gains were obtained on rape and alfalfa pasture, and that the amount of corn required to produce a unit of gain was approximately the same when shelled corn, protein supplement, and minerals were fed. However, pigs on rape pasture consumed 40 per cent more of the protein supplement than those on alfalfa pasture. When fed ground barley, ground oats, and minerals on alfalfa pasture, pigs made more rapid and economical gains than when receiving the same ration on rape pasture. A ration of shelled corn, protein supplement, and minerals had pigs ready for market 7 days earlier at a lower cost per unit of gain and returned a greater margin per pig than a ration of ground barley, ground oats, and minerals when both rations were fed on alfalfa pasture. Shelled corn in this study was found to be worth 13 per cent more than ground barley. A ration of ground barley, protein supplement, and minerals had pigs in market condition 4 days earlier at a slightly lower cost per unit of gain and returned a somewhat greater profit per pig than a ration of ground barley, ground oats, and minerals when both rations were fed on rape pasture.

II. *Full feeding compared with limited feeding of concentrates to spring pigs on alfalfa pasture.*—Pigs full fed on alfalfa pasture required only 2.8 per cent more concentrates, were finished for market 18 days earlier, and returned a somewhat larger profit than those allowed a limited ration (E. S. R., 61, p. 459).

III. *Feeding spring pigs for market on alfalfa pasture or in a dry lot.*—Pigs on alfalfa pasture made practically the same gain at a lower cost per unit of gain than similar pigs receiving the same ration plus alfalfa hay in dry lot (E. S. R., 61, p. 462). Based on the lower cost of gains produced plus the value of the hay cut, it was calculated that one acre of alfalfa had a feeding value of $29.16.

Appended are tables giving detailed results of the several experiments, together with a statistical analysis of these results.

Hogging off corn, W. E. J. Edwards (*Michigan Sta. Spec. Bul. 200 (1930), pp. 17, figs. 4*).—Concluding this series of studies (E. S. R., 57, p. 867), it was found that standing corn with soybeans returned a slightly higher value per bushel of corn than did standing corn and tankage, and a considerably higher value than standing corn and rape. Pigs on corn and tankage self-fed gained 0.071 lb. more per head daily than pigs on corn and rape, and 0.179 lb. more than pigs on corn and soybeans.

When tankage was fed with standing corn, pigs consumed 5.25 per cent less corn per 100 lbs. of gain than when soybeans were grown with the corn, and 13.7 per cent less than when rape was grown with the corn. When the tankage and mineral consumption were considered, the pigs receiving tankage required 1.24 per cent less concentrates than the pigs receiving soybeans and 9.9 per cent less than the pigs receiving rape to produce a unit of gain. The mineral consumption in the tankage lot was about one-half as much as in the rape lot and about one-third as much as in the soybean lot.

An acre of standing corn producing 31.17 bu. of grain and containing rape fed 8 pigs averaging 144 lbs. initial weight for 27 days. An acre of corn producing 26.58 bu. of grain and containing soybeans fed a similar lot of hogs for 27 days, while an acre producing 29.65 bu. of grain with 76 lbs. of tankage fed a similar lot for 28 days. Approximately 75 per cent of the pigs in these studies were ready for market when the corn was all consumed.

When all the factors involved in the hogging off of corn were considered, it was deemed safe to recommend this practice for finishing spring pigs for market.

Soybeans and soybean oilmeal for pigs, W. L. Robison (*Ohio Sta. Bul. 452 (1930), pp. 42, figs. 24*).—Concluding a series of studies (E. S. R., 63, p. 61) on the value of soybeans and soybean oil meal as a protein supplement for pigs, it was found that a mineral supplement was needed when soybeans or the oil meal was fed, that soybeans were not satisfactory as a supplement to corn for weanling pigs in dry lot, that they had a higher value for pigs on pasture than for those in dry lot, and that they were better suited for feeding to well-grown shotes than to younger pigs. Differences in palatability and feeding value were found among the varieties of soybeans.

When self-fed free choice, whole soybeans were as efficient as ground soybeans. Cooked soybeans were worth considerably more than ground soybeans for pigs in dry lot, and worth somewhat more for pigs on pasture. The cooked beans were more digestible than raw beans, and pigs fed the cooked beans were ready for market earlier than those fed raw beans. As a supplement to corn soybean oil meal was superior to ground soybeans, and a unit of protein in the oil meal was worth more than a unit of protein in tankage. The value of the oil meal depended on the method of manufacture.

Soybean oil meal, either in the seed or as added oil, had a softening effect on the body fat, the severity of the effect depending upon the amount of oil present in the ration. Pigs fed soybeans in quantities sufficient to supply the necessary protein from weaning time until they were ready for market were apt to kill soft. Such factors as rapidity of gain, weight of pigs at beginning of feeding period, length of time feeds were fed, and proportion of hardening to softening feeds used, influenced the firmness of the carcasses of pigs fed softening feeds. Cooking the beans had no influence on the firmness of pork except in so far as they produced faster gains. Soybean oil meal did not produce soft pork.

Swine publications and associations, A. L. ANDERSON and J. M. EVVARD (*Iowa Sta. Circ. 122* (*1930*), *pp. 8*).—This is a revision of the publication previously noted (E. S. R., 48, p. 373).

[Experiments with poultry at the Idaho Station] (*Idaho Sta. Bul. 170* (*1930*), *pp. 24, 25*).—The results of several experiments, most of which have been continued (E. S. R., 61, p. 861), are noted.

Relative humidity in relation to hatchability of eggs.—To determine accurately the relative humidity in forced-draft incubators with a wet bulb hygrometer it was found necessary to maintain the following conditions: "(1) A long thin mercury bulb on the thermometer, (2) a constantly moistened wick, (3) a water reservoir in such a position that the wick is on a gradual incline from the water to the thermometer, and (4) not over 1 in. of exposed wick between the reservoir and the end of the thermometer."

For maximum hatches the data so far obtained indicate that a relative humidity of from 65 to 80 per cent is needed at pipping and hatching time. Up to the eighteenth day of incubation the embryo can apparently tolerate a considerable range in relative humidity without serious effects.

For the artificial hatching of turkey eggs better results were obtained in still-air machines than in forced-draft machines.

Influence of alfalfa on yolk color.—The eggs of 6 pens of White Leghorn pullets on a normal laying ration but receiving alfalfa in varying forms and amounts were candled and classified according to yolk color. Birds having free access to the dry leaves of well-cured hay and those receiving 5 per cent of alfalfa leaf meal laid the highest percentage of eggs with pale and medium colored yolks. Soaked alfalfa leaves and 10 per cent of alfalfa leaf meal in the mash produced fewer eggs with pale and medium colored yolks.

Yellow corn and wheat for chicks grown in confinement.—A ration containing 60 per cent of ground yellow corn produced the best gains in weight and the greatest depth of pigmentation in chicks. When no yellow corn and 60 per cent of ground wheat was fed the chicks made poor gains and were quite inferior in pigmentation. With a ration of 40 per cent of ground yellow corn and 20 per cent of ground wheat, very satisfactory gains were made and a good degree of pigmentation was attained.

Correlation of yolk color and yellow pigment.—A very definite correlation was found between the yolk color of the egg and the intensity of the yellow pigment in the shanks of the chicks hatched. Eggs with pale yolks produced a high percentage of chicks with pale shanks and mostly of inferior quality.

Feeding young turkeys.—The regular chick starting mash supplemented with cut green feed produced excellent gains with young poults. Little danger of overfeeding and the elimination of considerable labor were the advantages of this system.

[Experiments with poultry at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 58–63, figs. 3*).—The results of several experiments in continuation of those previously noted are reported (E. S. R., 61, p. 365).

Does confinement cause anemia in chicks?—In handling chicks "kept inside and irradiated by means of a mercury vapor quartz lamp, fed cod-liver oil, fed cod-liver oil and irradiated, neither fed cod-liver oil nor irradiated, and exposed to direct sunlight," no significant differences were found in the red cell or hemoglobin content of the blood of the chicks.

Salt for growing chicks supplied by meat scrap.—Salt was added to a basal ration containing from 12 to 15 per cent of meat scrap (50 per cent protein) at levels of 0, 0.5, 1, and 2 per cent. There was no significant difference in the rate of growth of chicks during the first 8 weeks of the growing period. This indicated that the meat scrap contained sufficient salt to supplement the grains.

Animal protein studies with chicks.—Continuing these studies (E. S. R., 61, p. 63) with the same basal ration, a protein supplement containing 6 per cent of protein from meat and bone scraps plus 4 per cent of dried buttermilk was satisfactory in the growing ration of chicks during the first 10 weeks. A supplement containing 6 per cent of protein obtained from meat meal plus 4 per cent of dried buttermilk, with the mineral content corrected, was also satisfactory. When the mineral deficiency of the meat meal was not corrected, the chicks developed severe rickets within from 3 to 4 weeks.

Calcium and phosphorus requirements for growing chicks.—Studies with baby chicks have shown that even when the amount of minerals in the ration as well as the calcium-phosphorus ratio were varied widely the chicks did not grow satisfactorily without some form of vitamin D in the ration.

Is scab-infested barley harmful to chickens?—Scabby barley fed to pullets and to 8-weeks-old chicks at a 20 per cent level for 6 weeks had no apparent effect on mortality or rate of growth.

Meat scrap and dried milk as laying ration supplements.—There was no significant difference in the egg production of Barred Plymouth Rock pullets on a basal ration of yellow corn, wheat bran, and wheat middlings when either meat scrap alone or meat scrap and dried buttermilk were fed as protein supplements.

Cod-liver oil unnecessary with direct sunshine.—Winter sunlight again supplied ample vitamin D for layers, and no significant gain in egg production, hatchability of eggs, or livability of pullets followed the feeding of cod-liver oil.

Nothing gained from germinated oats.—The results obtained in the third year of this study substantiated those previously noted.

Whole yellow corn fed in mash troughs.—Whole yellow corn fed in the mash troughs about one hour before roosting time saved labor in mixing scratch grain and the trouble of feeding grain several times daily, and made it easy to feed the desired proportion of corn to mash.

Crossbreeding.—No sex linkage was observed in reciprocal crosses of White Wyandottes and Single Comb Rhode Island Reds. Some of the crossbreds were red with distinct white markings in the wing and tail and had a white undercoat.

The preserving of eggs until marketed.—For holding eggs on the farm an earthen jar buried on the north side of a building and covered with a suitable lid was found to retain the quality of infertile eggs for one week.

[Experiments with poultry at the Massachusetts Station] (*Massachusetts Sta. Bul. 260* (*1930*), *pp. 370, 371*).—The results of two studies are noted.

Breeding poultry for egg production, F. A. Hays and R. Sanborn.—The mean annual egg production of 552 birds hatched in 1927 was 197.3 eggs. This flock was quite good in early maturity, intensity, and nonbroodiness, but lacked somewhat in persistency. The 1928 hatched flock was significantly better in vigor, having a mortality rate in the laying house of only 14.85 per cent. The mean percentage of fertile eggs hatched in 1929 was 78. In this study age at first egg, body weight at first egg, high intensity, and low broodiness have been well established.

Factors governing egg weight and shell character in domestic fowl, F. A. Hays.—Daughters hatched from mothers laying 52-gm. or 53-gm. eggs in December showed no significant difference in mean winter egg weight. However, daughters from mothers averaging 59-gm. eggs in December showed a winter egg weight quite superior to the other groups.

Poultry (*Ohio Sta. Spec. Circ. 28* (*1930*), *pp. 32, figs. 8*).—The results of several studies are noted in this publication.

Getting winter eggs from hens, D. C. Kennard and V. D. Chamberlin (pp. 2–9).—The use of all-night lights in the production of winter eggs has been previously noted (E. S. R., 62, p. 369). Methods of feeding, management, and selection of birds for the production of winter eggs are also discussed.

The protein requirements of growing pullets, R. M. Bethke, P. R. Record, and D. C. Kennard (pp. 9–14).—In the first phase of this study different kinds and amounts of animal protein were fed to seven lots of 15 10-weeks-old pullets each confined indoors. The birds that received no animal protein were approximately 0.5 lb. lighter at 27 weeks of age than the other birds, but there was no significant difference in the weight of birds receiving some animal protein. No relationship was found between the percentage or kind of animal protein in the ration and the size or state of maturity of the bird at the date the first egg was laid. With the exception of a lot receiving no animal protein, all the birds came into a fairly uniform rate of production.

In the second phase, five lots of 50 10-weeks-old pullets each were fed different kinds and amounts of animal protein and had access to bluegrass range. While the birds receiving no animal protein averaged somewhat smaller at 24 weeks than the other lots, the difference was not so marked as in the case of the birds confined indoors. All the lots in this phase came into production at about the same time, but the birds receiving no animal protein were not so uniform in size and development as the other lots and did not lay as many eggs.

Coarse versus fine mash, D. C. Kennard (pp. 14–20).—Part of the results of this study have been previously noted (E. S. R., 57, p. 868).

In three tests of 44, 44, and 30 weeks, respectively, coarsely and finely ground mash were compared. The pullets receiving the coarse mash had a somewhat better egg production record and consumed somewhat more mash, but in only one of the three tests was the average weight per bird in favor of this method of grinding. On the whole, the coarsely ground mash was more effective for egg production than the finely ground mash.

Chicken vices, D. C. Kennard (pp. 20–27).—This is a more complete discussion of work previously noted (E. S. R., 60, p. 468).

Tipping the beaks, D. C. Kennard (pp. 27–29).—The method of tipping beaks to prevent feather picking and cannibalism has been previously noted (E. S. R., 60, p. 468).

Use of woven wire in poultry keeping (pp. 29, 30).—The particular uses for the different kinds of woven wire are discussed in this article.

Sun parlors for chicks (pp. 31, 32.)—The details for the construction of a sun parlor for chicks are set forth in this article.

Barley is satisfactory in poultry ration, J. M. Moore (*Michigan Sta. Quart. Bul., 12 (1930), No. 4, pp. 146–150*).—To compare barley with corn as a grain for poultry, 2 lots of 80 Rhode Island Red pullets were fed for 10 months. The mash fed to lot 1 consisted of ground wheat, finely ground barley, alfalfa leaf meal, meat scrap, steamed bone meal, and salt, while lot 2 received a mash made up of yellow corn meal, finely ground oats, bran, flour middlings, alfalfa leaf meal, meat scrap, steamed bone meal, and salt. The scratch grain in lot 1 consisted of equal parts of whole barley and whole wheat and in lot 2 equal parts of cracked yellow corn and wheat. Semisolid buttermilk was fed once a day, and during the hatching season 1 lb. of cod-liver oil was included with each 16 lbs. of buttermilk. Oyster shell, water, and lettuce were also fed. An attack of infectious bronchitis caused a high mortality in both lots.

Candling the eggs during June and July showed that the yolks of the eggs laid in lot 1 were lighter in color than those in lot 2, and that the shells of the eggs in the barley-fed lot were not so strong as those in the corn-fed lot. The percentage hatch of fertile eggs set was about 10 per cent higher in lot 1 than in lot 2. Over a 10-months period lot 2 produced 6 more eggs per bird than lot 1, but at a greater cost per dozen. These results, while not conclusive, indicate that the barley ration may be safely substituted for the corn ration.

The molting factor in judging fowls for egg production, D. R. Marble (*New York Cornell Sta. Bul. 503 (1930), pp. 42, figs. 16*).—Three flocks of 53, 66, and 24 Single Comb White Leghorn hens, respectively, were studied in this experiment. The first flock was studied from November, 1924, to March, 1926; the second from November, 1925, to March, 1927; and the third from June, 1926, to March, 1927. The first two flocks were high-producing strains of birds, and the third flock was a low-producing strain. Observations were made every two weeks on the first two flocks from November to the first of June and weekly thereafter, while weekly observations were made on the third flock. At the time of observation each bird was examined individually, and the degree of molt taking place in each part of the body was noted.

A fairly regular order of molt was found in the different parts of the body of the fowl. The molt of the body feathers preceded the molt of the wing or tail feathers by only a few days, and primary-feather molt preceded secondary- and tail-feather molts by a few days in birds that ceased laying at the beginning of molt. The molts of secondary and tail feathers were delayed when birds continued to lay and to molt their primary feathers, but when the secondary and tail feathers dropped, laying usually ceased. The molt of secondary feathers was not so regular as the molt of primary feathers. The usual order of molt for the secondaries, counting from the axial feather toward the body, was 11, 12, 13, 14, 10, 2, 3, 4, 5, 6, 7, 8, 9, 1. The axial feather usually dropped at the same time as the first secondary feather.

Birds that molted in the summer and dropped a part of their primary feathers completed the molt of these feathers during the regular fall molt, and then repeated the molt of all feathers dropped during the summer. The low producers began molting earlier and molted more of the body plumage than did the high producers. The latter birds molted as much as one-fifth of their body plumage before laying ceased, while the poor layers ceased laying before any or scarcely any molt had taken place. The total amount of molt of primary feathers was practically the same in low and high producers. A definite relationship existed between annual egg production and the amount of primary wing molt previous to the cessation of production. While the peak of body molt was reached much earlier than the peak of wing molt, both were completed at approximately the same time.

Heavy-producing birds came into laying after the regular fall molt at the same time as the low producers when both were managed in the same way. The early-molting birds often repeated the molting process, thereby molting more of the body plumage than the late-molting birds, and the birds that molted primaries early in the summer usually went through a more nearly total molt in the wing than did the late-molting birds. The birds that molted their first primary feathers late in the fall usually went through little molt prior to the cessation of production. The birds that ceased production earlier because of repeated body molts renewed more body plumage than the birds that stopped laying late in the fall, but did not renew any more wing feathers. On the other hand, birds that ceased laying late renewed a much larger number of wing feathers before the cessation of production than birds that stopped laying early. When the time from the dropping of the first to the last primary feather was considered as the length of molt, no relationship was found between this time and egg production. If, however, the time during which the birds were in production during the molt period was deducted from the molt period, a strong negative relationship was found to exist. The early-molting birds dropped their primaries more slowly than did the late-molting birds.

No relationship was found between egg production and the total molting time, or between the time laying ceased and the total molting time, when the birds were grouped according to the month in which they stopped laying; but a strong negative relationship was found between the time laying ceased and the net time per feather that existed between the dropping of the first and the last primary. There was apparently no relationship between egg production and rate of growth of primary feathers, or between the time of molt and the rate of growth.

During the first 3 weeks of growth about 60 per cent of the total length of the primary feathers was renewed, but no primary feathers were renewed in less than 6 weeks, and in this time about 95 per cent of the feather was grown. After the first 3 weeks, in which approximately 20 per cent of the total length of the primary feather was grown, the rate of growth decreased each week. The shape of the primary feather had no effect on the rate of dropping or on the rate of growth, nor was there any relationship between egg production and shape of feather. The percentage of production of birds molting and laying at the same time for a period of 4 weeks was not reduced materially during that period, and the total amount of body, wing, and tail molt was considerably less in birds that were molting and laying at the same time than in birds that had stopped laying and were only molting. The molting of more than one feather at a time was not confined entirely to high-producing hens, but such birds dropped a larger percentage of their total molt in this manner. There was no difference in the length or in the breadth of the primary feathers of low and high producers, or of early and late molters.

Based on these results, it is concluded that molt alone can not be used in judging birds for egg production.

The New Jersey egg-laying contests, J. W. GOODMAN (*New Jersey Stas. Hints to Poultrymen, 18 (1930), No. 8, pp. 4*).—The location and equipment of the Vineland, Passaic County, and Hunterdon County egg-laying contests, the records and reports made at each, the size of the entry, and the management of the contest birds are described in this publication.

The breeding of poultry [trans. title], J. BLANCH, JR. (*Porto Rico Dept. Agr. and Labor Sta. Circ. 91 (1930), Spanish ed., pp. 53, figs. 23*).—A popular publication on the management, feeding, and selection of poultry, together with a discussion of some of the more common diseases affecting poultry.

Rearing turkeys in confinement, H. H. ALP (*Illinois Sta. Circ. 357 (1930), pp. 4, figs. 4*).—A popular publication discussing the incubation, brooding, and feeding of turkeys in confinement and the care of the breeding flock.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Idaho Station] (*Idaho Sta. Bul. 170 (1930), pp. 19, 20*).—Two experiments are briefly noted (E. S. R., 61, p. 865).

Calf feeding investigations.—Normal growth and thrifty appearance were attained by 7 calves fed for 6 months on hay and grain together with 12 lbs. of skim milk per day for the entire period.

A study of udder infections.—A study was made in cooperation with the department of bacteriology of the bacterial counts of first milking, middle milking, and strippings of each quarter of the udders of 12 cows. The counts varied widely from cow to cow, and in some cases individual quarters showed considerable variation. The count was highest in the first milking, and the middle milking was usually the best measure of the number of bacteria present. The count of the milk of cows with garget tendencies was very high. An unsuccessful attempt was made to identify streptococci into serological groups by agglutination tests.

[Experiments with dairy cattle at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 28–30, figs. 2*).—The results of three studies are noted.

Sudan grass as summer pasture for cows.—In this study 2 lots of 5 cows each were pastured on 8.5 acres of Sudan grass for 6 weeks, beginning July 16. One lot received a grain supplement in addition to pasture, while the second lot was on pasture alone. During the pasture period the first lot produced 4,072 lbs. of milk at a cost of 71.6 cts. per hundredweight and 138 lbs. of fat at a cost of 21 cts. per pound, while the second lot produced 3,544 lbs. of milk at a cost of 35.5 cts. per hundredweight and 115 lbs. of fat at a cost of 10 cts. per pound. Following the pasture period both lots were fed for 5 weeks on a ration of grain, hay, and silage, during which time they produced milk at about the same cost per hundredweight. However, the cows that had been on pasture alone produced fat at a cost of 49.7 cts. per pound, while those that had received the grain supplement produced fat at a cost of 44 cts. per pound.

Comparison of early and late cut soybean hay for milk and fat production.—Using the double reversal method, 2 lots of 6 cows each were fed for 105 days on the same basal grain ration. Immature soybean hay cut after a growing period of 88 days was fed during one period, followed by mature soybean hay cut after a growing period of 109 days. It was found that 100 lbs. of immature hay produced 86.3 lbs. of milk and 100 lbs. of mature hay produced 92.7 lbs. of milk. For each ton of mature hay eaten the cows produced 128 lbs. more milk than was produced per ton of immature hay consumed. Only 2.45 and 4.43

per cent of the immature and mature hay, respectively, was refused by the cows.

Comparison of ground and shredded corn stover for milk production.—Preliminary results in a 105-day test in which 2 lots of 6 cows each were fed by the double reversal method indicated that it was not profitable nor necessary to grind corn stover for dairy cows. In some cases the ground stover apparently caused the cows to go off feed and to decrease markedly in milk production.

Feeding dairy cows, R. H. Lush (*Louisiana Stas. Circ. 1 (1930), pp. 60, figs. 3*).—This is a popular publication discussing the value of the various grains, protein concentrates, roughages, and pastures for dairy cattle. The use of feed by the cow, the characteristic of good rations, crops for home-grown feeds, and the methods of computing a ration are also discussed. Rations for dairy animals are suggested. Appended are tables giving information for use in making up rations.

Alfalfa in a high plains dairy ration, W. E. Connell ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 18 (1930), pp. 3–6*).—In an effort to determine the value of alfalfa hay as a partial source of protein in a dairy ration under conditions as they exist at the Panhandle Station, 2 groups of 4 and 3 Holstein-Friesian cows, respectively, were fed for 2 20-day periods by the reversal method with 10-day transition periods. Both lots received the same grain ration, but sorghum hay was fed to one lot and alfalfa and sorghum hay, equal parts, to the other lot. When alfalfa hay was included in the ration the amount of cottonseed meal fed was reduced one-half.

Although no definite conclusions could be drawn from the experiment, it was calculated that the addition of the alfalfa hay increased the cost of production, but that an increase in the yield of milk of 2.28 lbs. daily per cow was more than enough to pay the additional cost.

Feeding Hevea rubber seed meal for milk production, W. B. Ellett, C. W. Holdaway, J. F. Eheart, and L. D. Lasting (*Virginia Sta. Tech. Bul. 41 (1930), pp. 12*).—To determine the value of Hevea rubber seed meal, a by-product from the processing of the kernels of the seed of the Para rubber tree, 2 groups of 2 cows each were fed by the reversal method. The basal ration for each group consisted of 20 lbs. of corn silage and 8 lbs. of alfalfa hay to which was added in one group 5 lbs. of Hevea rubber seed meal and in the other group 5 lbs. of linseed meal. The groups were fed in this manner through a 10-day preliminary and a 30-day milk production period, after which the rations were reversed for similar periods. While receiving the rubber seed meal, the cows produced 1,937.9 lbs. of milk and 78.06 lbs. of butterfat, and during the linseed meal period they produced 1,779.4 lbs. of milk and 71.4 lbs. of butterfat.

Digestibility trials with the same cows showed the following coefficients of digestibility for the components of Hevea rubber seed meal: Dry matter 51.5 per cent, crude protein 71.3, ether extract 92.5, crude fiber 20.5, and nitrogen-free extract 58.1 per cent.

The results of this study indicate that Hevea rubber seed meal may be used as a medium protein concentrate in rations for dairy cows, that it is palatable, that it has no bad physiological effects, and that it is apparently equal to linseed meal for supporting milk production.

Raising dairy calves, G. B. Caine (*Utah Sta. Circ. 87 (1930), pp. 12, figs. 4*).—The care, feeding, and management necessary for the production of normal, healthy dairy calves are discussed in this publication.

[Experiments in dairying at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 30–32, fig. 1*).—Three studies are noted.

The relation of physical properties of the ice cream mix to swell.—The results obtained in this study indicate that mixes aged for 24 or 48 hours, because of their higher viscosities, have a more uniform overrun when drawn from the freezer than fresh mixes with relatively low viscosities. A variation of approximately 8 per cent in overrun was noted for the contents of 5-gal. cans of ice cream made from fresh mixes. This variation was reduced to 3 and 4 per cent in the aged mixes. It was not always possible to obtain the desired overrun with fresh mixes.

The study of enzymes in sweet and sour farm skimmed cream as related to the keeping qualities of butter.—A suitable medium was inoculated with *Bacillus ichthyosmius* incubated for 7 days, then autolyzed for 7 days in the presence of toluol. The autolysate was added to sterile milk and gelatin and held at 37° C. Analyses were made at the end of 5, 10, and 15 days to determine the rate of hydrolysis. The pH values varied from 8 to 3 and sodium chloride concentrations of 0, 2, 4, 6, 10, and 20 per cent were used.

Optimum hydrolysis was produced at pH 6–8, with a rapid decrease at pH 4, and only slight hydrolysis at pH 3. When no sodium chloride was present the soluble nitrogen not precipitated by phosphotungstic acid at the end of 15 days' digestion of milk proteins was 16.65 per cent at pH 8, 12.95 at pH 6, 2.65 at pH 4, and no increase in soluble nitrogen at pH 3. There was no decrease in proteolytic action when 2 per cent of sodium chloride was added, but a slight progressive decrease occurred when 4, 6, and 10 per cent of sodium chloride was used. When 20 per cent of sodium chloride was added the soluble nitrogen not precipitated by phosphotungstic acid was 8.82 per cent at pH 8, 3.35 at pH 6, and none at pH 4 or pH 3. Similar results were obtained by the action of these enzymes on gelatin.

A study of methods used in washing and sterilizing of milking machines and their comparative value.—Milking machines were successfully washed by sucking at least 1.5 gal. of cold water into the unit immediately after using. This was followed by sucking 1 gal. of hot water at a temperature of from 160 to 190° F. into the unit. This washing removed all the milk and heated the metal and rubber parts to a temperature sufficient to destroy the majority of the bacteria. When the average air temperature was above 60° it was necessary to fill the teat cups and milk tubes with sodium hypochloride at a strength of 200 parts per million.

Proteolysis by Streptococcus lactis, with special reference to butter cultures and butter, B. W. Hammer and V. H. Patil (*Iowa Sta. Research Bul. 123 (1930), pp. 57–91*).—The object of this study was to obtain information concerning the factors influencing protein degradation by *S. lactis* (E. S. R., 61, p. 563) either in pure cultures or in butter cultures. The effects of the organism in both milk and butter were studied.

Definite proteolysis of milk was obtained with certain cultures of milk but none with other cultures. Proteolysis was evident in 1.5 days without the addition of calcium carbonate to the milk, and it was also evident in freshly coagulated butter cultures grown in pasteurized or sterile milk. With both *S. lactis* and butter cultures, proteolysis was more pronounced on extended holding when calcium carbonate was added to the milk than when it was omitted. Adding sufficient sterile lactic acid to bring the final acidity to 1 or 2 per cent did not increase the amount of soluble or amino nitrogen after a holding period at room temperature. The supply of air did not affect the proteolysis caused by either the pure or the butter cultures, while adding 0.1 per cent of peptone or alanine to the milk retarded slightly the protein decomposition.

Two types of *S. lactis* cultures, a proteolytic and a nonproteolytic, were studied. The first type coagulated milk rapidly at room temperature, while the second type showed considerable variation in the rate of coagulation, but was never as rapid as the first type. The general correlation between the proteolytic activity of the culture and the rate of coagulation did not hold at 30 to 37° C. The inherent proteolytic properties of the *S. lactis* cultures were not influenced by incubation at 30 or 37°, by repeated transferring at room temperature or at 37°, or by holding in soil or calcium carbonate milk for four months without transferring.

No consistent differences in the soluble and amino nitrogen values were found between butter made with a proteolytic strain of *S. lactis* and that made with a nonproteolytic strain. In butter stored at different temperatures and for varying periods, no proteolysis by *S. lactis* was evident. No differences in flavor and aroma could be detected in butter made with a proteolytic strain and that made with a nonproteolytic strain. The decrease in quality of butter during storage was not due to proteolysis by *S. lactis*.

The results indicate that *S. lactis* strains which cause proteolysis in milk have no significant effect on the keeping quality of butter.

Standardization of milk for cheese making (*Idaho Sta. Bul. 170 (1930), p. 20.*)—Continuing this study (E. S. R., 61, p. 869), it was found that the yield of cheese was increased 11.6 per cent if milk having a ratio of fat to serum solids of 1:2.4 was standardized by the addition of skim milk powder to a ratio of 1:2.8. Standardizing also decreased the cost of the raw products per pound of cheese 0.9 ct. In flavor, body, and texture score and in chemical analyses such cheese was of satisfactory quality.

[Experiments with ice cream at the Massachusetts Station] (*Massachusetts Sta. Bul. 260 (1930), pp. 346, 347, 348*).—The results of three experiments are noted.

A study of packaged ice cream, K. E. Wright.—Continuing this study (E. S. R., 61, p. 566), no difference was found in the rate of cooling samples drawn from the freezer at varying temperatures so far as evolution of heat fusion and crystal formation were concerned

In a study of the effect of aging on the texture of ice cream, it was determined that a high initial temperature in the aging period favored the development of greater basic viscosity. Maximum viscosity was obtained when the mix was held at 80 to 100° F. for 2 to 4 hours without agitation. As the viscosity increased the whipping properties and the rate of melting decreased, and the texture improved. The aging influence was attributed to factors affecting crystallization of the gelatin portion of the mix.

The utilization of frozen fruits in ice cream, M. J. Mack.—In this study it was found that the varieties of fruit best suited for freezing were also best suited for use in ice cream. Approximately 15 per cent of cold-packed strawberries, from 8 to 10 per cent of raspberries plus a suitable amount of raspberry extract, from 15 to 20 per cent of peaches with extract, and 12 per cent of cherries were found to give optimum flavor in a mix. To obtain the maximum fruit flavor and even fruit distribution, the fruit should be added to the mix directly after the freezing operation is started. This also insures a more rapid freezing and whipping of the ice cream. Fruit ice creams have a lower freezing point, cool faster in the freezer, whip faster, and require a shorter time of brine flow than does plain ice cream.

Other data under this project are noted on page 591.

A study of frozen sweet cream for use in ice cream, M. J. Mack.—Good quality sweet cream remained in good condition for several months when stored at 0° F. or lower. An ice cream of desirable flavor was made from frozen cream when not more than one-third of the fat content of the mix was obtained from such cream. Mixes made with this cream were high in viscosity, part of which was due to excessive clustering of fat globules after homogenization. Such cream increased the time required to whip the ice cream from 10 to 20 per cent. Studies indicated that adding some of the gelatin or sugar to the frozen sweet cream previous to freezing reduced viscosity and the time required to whip the mix.

The influence of sugar and butterfat on quality of ice cream, P. S. Lucas, T. Matsui, and D. E. Mook (*Michigan Sta. Spec. Bul. 201 (1930), pp. 22*).—The results of two studies are reported in this bulletin.

Results secured by varying sugar content.—In this study 5 mixes containing 12 per cent of fat and 10 per cent of serum solids were used. The respective mixes contained 11, 13, 15, 17, and 19 per cent of sugar, and the percentages of total solids were 33.6, 35.6, 37.6, 39.6, and 41.6. Each mix was pasteurized at 145° F. for 25 minutes, cooled to 110°, viscolized at 1,500 lbs. pressure, cooled to 35°, and aged at that temperature for 48 hours before freezing. Each mix was frozen uniformly, with overrun readings made at 2-minute intervals, and an overrun of 75 per cent was obtained before taking samples. The samples were tested for specific gravity, freezing point, and swell. Quart samples hardened for 48 hours were placed on a large screen in a closed room at 86° for melting tests, and in addition each batch was scored for body and texture.

Increasing the sugar content had a depressing effect upon the incorporation of air, particularly when the amount used exceeded 13 per cent, and also increased the time required to obtain maximum overrun. Each 2 per cent increase in sugar content increased the specific gravity approximately 0.2 per cent and lowered the freezing point about 0.4 of a degree. The latter decrease was not uniform, being dependent upon the sugar content of the cream. Melting tests verified these results, showing that creams of high sugar content possessed poor standing-up properties. The mixes containing from 15 to 17 per cent of sugar scored highest in body and texture, but since mixes containing 17 per cent of sugar were considered too sweet, it is concluded that the optimum sugar content lies between 13 and 15 per cent.

Influence of butterfat and milk solids-not-fat on ice cream.—This is a more detailed account of work previously noted (E. S. R., 58, p. 69).

A comparison of aging periods for ice cream mixes, J. C. Hening (*New York State Sta. Tech. Bul. 161 (1930), pp. 21, figs. 4*).—The effect of aging on the properties of each principal ingredient of homogenized and unhomogenized ice cream mixes with and without gelatin was determined in this study. The mixes were considered aged when they had been held at 4.4° C. (40° F.) for from 18 to 24 hours before freezing, and unaged when held from 2 to 4 hours. Mixes of different combinations of ingredients were used in the study.

Ice cream mixes prepared with serum solids from different sources were found to whip to very high overruns and to have varying whipping properties. Aging caused no marked improvement in serum solid mixes with gelatin or condensed skim milk, but did improve the whipping qualities of skim milk plus skim milk powder serum solid mixes without fat or gelatin. In only 6 of 19 trials did aging improve the texture of serum solid mixes made with 10, 15, and 20 per cent of serum solid plus 15 per cent of sugar. The apparent viscosity of serum solid mixes without gelatin was not appreciably changed by aging.

When mixes were prepared with butter, skim milk powder, sugar, and water, aging caused them to whip faster than unaged mixes, but when prepared with butter, skim milk, and skim milk powder aging did not have the same effect. When butter was used in their preparation mixes were very viscous and hard to whip. No direct relationship was found between viscosity and whipping qualities of ice cream mixes, but in a general way there was an inverse relationship between overrun and viscosity.

From a commercial standpoint the author considers it doubtful whether the effect of aging ice cream mixes for more than from 2 to 4 hours is significant when properly balanced and processed mixes containing 10 per cent or more of fat are used.

Use of honey in ice cream manufacture, P. H. TRACY, H. A. RUEHE, and F. P. SANMANN (*Illinois Sta. Bul. 345 (1930), pp. 285–300, fig. 1*).—Concluding this study (E. S. R., 62, p. 372), it was determined that honey could successfully replace from 50 to 100 per cent of the sugar in an ice cream mix. Because of difficulties encountered in freezing, it is not usually advisable to replace more than 75 per cent of the sugar with honey. Nine per cent of honey was found to be the minimum amount that would give an appreciable honey flavor, while the use of from 14 to 18 per cent produced more satisfactory results. When used as the sole sweetening agent, from 16 to 18 per cent honey by weight was sufficient to sweeten and flavor the mix.

The average percentage of total solids in the samples of honey studied as determined by the Mojonnier method was 81.305, with a minimum of 75.37 and a maximum of 91.36. No difficulties were encountered in pasteurizing honey mixes. As a rule the honey ice creams could be stored for several weeks without impairing the flavor, although in a few cases a stale flavor developed. The addition of the beeswax to the honey did not appear to influence this flavor defect. While the honey ice cream mixes cost on the average approximately 4 cts. more per gallon than mixes flavored with pure vanilla and sweetened with sugar, they cost about 11 cts. less per gallon than the average fruit mixes.

Appended are formulas for honey ice cream.

Honey may be used in ice cream, P. S. LUCAS (*Michigan Sta. Quart. Bul., 12 (1930), No. 4, pp. 142, 143*).—In this article the author discusses the use and value of honey in ice cream. Recipes for the use of honey in making coatings for ice cream bars, with the advantages and disadvantages of each, are presented.

Supplement to handbook of dairy statistics, T. R. PIRTLE (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. 18*).—This is a supplement to the handbook previously noted (E. S. R., 59, p. 577).

VETERINARY MEDICINE

[Report of the department of veterinary pathology of the Colorado Station], I. E. NEWSOM (*Colorado Sta. Rpt. 1929, pp. 67–69*).—In work on the presence of spore-bearing anaerobes in the spleens of sheep (E. S. R., 62, p. 562), 66 organisms of this type were encountered in the spleens of 200 animals. Of these, 58 were *Clostridium oedematis*, 6 *C. welchii*, and 2 *C. novyi*. On the basis of the clinical diagnosis it appears that these organisms have no relation to overeating nor any of the other diseases in which they were found.

A survey was made by F. Cross for the presence of icterohematuria, who found it to be most prevalent in the mountainous area of Jackson, Grand, Routt, and Moffat Counties, with single outbreaks occurring in sheep from Lake, San Miguel, and Dolores Counties.

[Report of the department of veterinary science at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 70–73*).—In a study made of the clinical symptoms and pathology of leukemia in several hundred chickens it was found that there were at least two distinct types of neoplasms. One is a primary overgrowth of the bone marrow that is similar, if not identical, to chloroma in man; the other, known as lymphocytoma, lymphosarcoma, etc., occurs primarily in the hematopoietic system other than the bone marrow. As a result of the work 350 cases of malignant neoplasms in chickens, representing 30 types, have been assembled. Six outbreaks of infectious bronchitis were investigated for the presence of the fowl pox virus, and in 1 of the 6 it was detected in the tracheal and bronchial exudate.

One of the several cases of encephalitis met with in sheep was associated with a respiratory disease. Several outbreaks of an acute respiratory disease in sheep occurring mainly in feeder sheep shipped to feed yards in the State were investigated. The affection was characterized by a very rapid course in many cases and by lesions in the bronchi and lungs similar to what occur in influenza in other animals. Attempts to reproduce the disease by injecting healthy young sheep in various ways with pulmonary and bronchial exudate and cultures of bacteria obtained from typical cases failed.

In reporting upon work with anemia in pigs the effects of housing, irradiation, and outside conditions on hemoglobin are summarized in tabular form. Six anemic pigs injected in the snout with a suspension of bullnose material developed typical bullnose, while seven nonanemic pigs similarly injected suffered no ill effects. The feeding of a suspension of bullnose material failed to produce either bullnose or necrotic enteritis.

Two of 11 calves that were inoculated intravenously with *Bacterium abortus* when a few weeks of age ceased to react positively to the complement fixation and agglutination tests 10 weeks after the inoculation. Three of the 5 calves, 1 bull and 2 heifers, were reinoculated, the 2 heifers reacting positively to both serological tests within the next several months. Experimental evidence indicates that the colostral milk collected just before parturition may be more reliable than blood serum for the diagnosis of infectious abortion when either the complement fixation or agglutination test is used.

Gilts fed milk from a herd of cows that was responsible for an outbreak of undulant fever in a group of people failed to give evidence of infection upon application of serological tests. Neither were gross nor microscopic lesions detected when after farrowing the gilts were slaughtered.

[Report of the department of veterinary science of the Nevada Station], E. Records and L. R. Vawter (*Nevada Sta. Rpt. 1929, pp. 19–21*).—Reference is made to work with hemorrhagic disease in cattle, an account of which has been noted (E. S. R., 62, p. 76). It is pointed out that as a result of recent work it seems probable that a new form of preventive vaccine will be devised, and that the means by which the disease is spread will be detected. The work of the fiscal year resulted in successful tests of a second form of vaccine. Over 600 cattle were vaccinated and no cases of the disease occurred among them, while among the group of animals that had not been vaccinated a number of animals succumbed. A study of strains of the organism recovered from cases in different parts of the State indicates that they are the same.

Reference is made to the progress of work with lymphangitis in cattle, a skin disease resembling and reacting to tests for tuberculosis.

Guide to the study of animal parasites, W. A. Riley and R. O. Christenson (*New York and London: McGraw-Hill Book Co., 1930, pp. XV+131, figs. 34*).—This is a laboratory guide to a general course on animal parasites. A list, arranged systematically, of the more important entozoa of laboratory animals, including the cat, chicken, dog, frog, pig, rabbit, rat, and sheep, and another of references to the more important literature are included.

[Notes on parasitology] (*Jour. Parasitol., 16 (1930), No. 3, pp. 158, 159, 161, 162, 163, 164, 167, 168, 169*).—A new tapeworm, with cysticercoids in a ground beetle, which was collected from the viscera of two guinea fowls obtained from the market in Washington, D. C., is described by M. F. Jones as *Raillietina* (*Paroniella*) *magninumida* n. sp. Reference is also made by this author to the finding of cystercoids of *R.* (*Skrjabinia*) *cesticillus* in the ground beetle *Selenophorus pedicularius* and to several new host records for bird cestodes also recorded from this country for the first time.

The occurrence in and heavy infestation by *Trichostrongylus rugatus* Monnig of a young mountain sheep which died at the National Zoological Park is recorded by E. W. Price.

A severe epizootic on a quail farm near Richmond, Va., is reported by E. A. Allen as being due to a Trichomonas resembling *T. gallinarium* of the chicken. The Trichomonas was successfully transmitted to chickens, and the same condition occurred in them as in the quail, indicating that this parasite in sufficient numbers is pathogenic for both fowl. Cultures from the heart blood, spleen, and ceca of quail by [W. B.] Shook resulted in the detection of the presence of *Bacillus coli* in the heart blood.

The presence of the parasite *Globidium* sp. in 24 of 251 sheep is reported by J. E. Alicata. They appear as small, white nodules located in the mucous lining of the abomasum.

Based upon experimental feedings, the ground beetle *Cratacanthus dubius* was found by M. F. Jones to serve as an intermediate host for the cestode *R.* (*Skrjabinia*) *cesticillus*.

The presence of the nematode *Ornithostrongylus quadriradiatus* was found by E. E. Wehr in mourning doves examined at Miles City, Mont. The cestode *Fimbriaria fasciolaris* was found by him to parasitize mallard ducks killed near Miles City. This is said to be the first record of its occurrence in the mallard in the United States, although reported by several authors from various other birds of the order Anseres. The nematode of the genus Habronema was found by Wehr underneath the tunic lining of the gizzard of the sage grouse killed in October in Miles City.

The occurrence of larvae in small pearly cysts beneath the pleural covering of the lungs and under the capsule of the liver of swine from Madison, Wis., reported upon by B. Schwartz and J. E. Alicata, is thought to correspond to the stage of *Ascaris lumbricoides* described from the lungs.

Porcellio scaber is reported by E. B. Cram to be the intermediate host of *Dispharynx spiralis* of birds in the United States, an account of which has been noted (E. S. R., 63, p. 155).

The infection of a half grown wild rat with *Moniliformis moniliformis* at San Juan, P. R., is reported by W. A. Hoffman. The small intestine of a rat yielded 167 specimens of *M. moniliformis*, the weakness of the rat having been due to the starved condition that resulted.

The Sarcosporidia, a critical review, J. W. Scott (*Jour. Parasitol., 16 (1930), No. 3, pp. 111–130*).—This extended discussion contributed from the Wyoming Experiment Station is accompanied by a list of 58 of the more important references to the literature issued since Teichmann's paper in 1912 (E. S. R., 27, p. 460). The review is presented under the headings of the morphology and development of the sarcocyst, the life history, and host parasite relations.

[Work with infectious abortion and other infections] (*Idaho Sta. Bul. 170 (1930), pp. 16, 17, 18*).—A brief reference is made to the progress of work in eliminating infectious abortion from a dairy herd (E. S. R., 61, p. 873). In testing 1,500 cows, representing 76 herds, 58 herds were found infected and 14 per cent of all cows tested reacted positively. Routine tests made on 1,155 miscellaneous samples indicated an abortion infection incidence of 21.5 per cent.

Work with udder infection (E. S. R., 61, p. 873) led to the conclusion that agglutination is not a desirable means of identifying or arranging streptococci in serological groups. Studies of the bacterial flora of normal and diseased udders have shown that the occurrence of mastitis in cows is associated with an abnormally high bacterial count as determined by the plate method when lactose agar is used. The kinds and numbers of bacteria present indicate that a fairly complex microflora may be present during the course of the disease.

The double intradermal test for the diagnosis of bovine infectious abortion, R. Gwatkin and R. A. McIntosh (*Ontario Vet. Col. Rpt. 1929, pp. 52–56*).—A comparison was made on 12 cows and 2 steers of the agglutination test and Holtum's double intradermal test for infectious abortion. The tests were checked by guinea pig inoculation of samples of milk and milk sediment. Seven cows were positive or suspicious by the agglutination test and five were negative. All were positive by the abortion test. The 2 steers were negative by both tests. The milk of 3 cows was shown to be infected, these 3 being the only ones giving a titer of 1:500 or over.

Bang's abortion disease, H. Morris (*Louisiana Stas. Circ. 3 (1930), pp. 8, fig. 1*).—A practical summary of information.

Carotenosis of bovine livers associated with parenchymatous degeneration, J. S. Buckley, E. C. Joss, G. T. Creech, and J. F. Couch (*Jour. Agr. Research* [*U. S.*], *40 (1930), No. 11, pp. 991–1005, figs. 12*).—An unusual condition in the livers of cattle met with in the course of post-mortem inspection at slaughtering establishments operating under Federal meat inspection led to the investigation here reported. The outstanding gross characteristic of the condition was an intense yellow or reddish-yellow coloration of the liver tissue, while all other organs and tissues in the carcass, except the associated hepatic lymph gland which showed a yellowish mottled appearance, were normal in color and general appearance. Specimens of the yellow livers studied were received from five cattle-slaughtering centers, the history of which indicates that the condition is found most frequently, if not altogether, in cattle from the southwestern part of the United States.

The studies indicate that the destructive changes in these livers are in all probability due to a toxic substance, the nature of which has not yet been determined. That this substance is of specific nature is indicated by the similarity of the lesions in the different cases studied. In view of the evidence at hand and the limited available history of the cattle affected, the writers are of the opinion that the causative agent, or toxic substance, is a constituent of some plant indigenous to the region or locality where the affected cattle had their origin. The yellow coloring matter, or pigment, found in the affected livers has been definitely identified as carotene, and it is thought that the carotenosis in these cases is simply an associated condition in which, for some reason difficult to explain, the excess carotene is stored up in the liver, while other tissues of the body remain unaffected.

For the purpose of securing further information relative to this peculiar tendency of the bovine liver to store up carotene in large quantities, feeding experiments were carried out with rats. The rats were fed 5 or 10 gm. daily of typical yellow liver for some weeks. On post-mortem examination the livers of these rats were found to be very pale or light in color, though there was no distinct evidence of yellowing; each of the livers also showed a number of small, whitish areas, which were subsequently found to be necrotic foci. On chemical analysis, however, none of the livers of the experimental rats showed an abnormal quantity of carotene. Control animals fed on normal bovine liver grew more rapidly than animals fed yellow livers of high carotene content.

Thallium poisoning in sheep, J. C. Ward (*Jour. Amer. Pharm. Assoc., 19 (1930), No. 6, pp. 556–559, figs. 5*).—The introduction of thallium into this country in proprietary rat poisons about 1920 and its use as a lethal agent in the control of noxious rodents led to this investigation by the U. S. D. A. Bureau of Biological Survey and the Colorado Experiment Station, cooperating. The investigation became of primary importance due to the fact that sheep losses were occurring on areas that had been treated with thallium-poisoned grain for the control of prairie dogs. It was found that the minimum lethal dose of thallium for sheep is about 25 mg. per kilogram weight, but that sheep will not readily accept thallium-poisoned rolled oats. Thallium poisoning causes alopecia in sublethal doses down to 8 mg. per kilogram weight. This element can be readily isolated from the liver and kidneys of sheep killed by it. Post-mortem findings show areas of irritation in the fourth stomach and duodenum, together with kidney degeneration. Death in most cases is apparently due to respiratory failure.

Oestrus ovis in sheep (*Idaho Sta. Bul. 170 (1930), p. 16*).—In a study of the correlation of nasal discharge and infestation with *O. ovis* grub in sheep as well as the extent of injury to infested sheep, Rambouillets showed a lower percentage of mucopurulent nasal discharge (7+ per cent) than Panamas (25 per cent), Hampshires (28+ per cent), Suffolks (21+ per cent), Lincolns (18+ per cent), or Southdowns (24+ per cent). A total of 258 head were examined. At autopsy of eight sheep that died or were killed the number of grubs varied from 2 to 14 per sheep, the lesions found consisting largely of an accumulation of purulent material in the sinuses affected as well as in the nasal passage proper.

Anemia in suckling pigs, F. W. Schofield (*Ontario Vet. Col. Rpt. 1929, pp. 44–50, figs. 4*).—The author has found that anemia frequently develops in suckling pigs during the first two weeks of life; that the feeding of iron and iron and copper to the mother during pregnancy failed to prevent the occurrence of the disease in the offspring; that spontaneous recovery occurs in a large number of cases, providing the animals survive to the sixth week; and that the acute infections with high mortality which occur frequently among young pigs are consequent upon the anemic condition.

It is concluded that the disease can be prevented by an environment which includes fresh air, sunshine, soil, and green feed. Since an outdoor environment is impossible during the winter months, a further study of the problem is required to determine the exact nature of the factors in such environment which prevent the occurrence of anemia in suckling pigs.

Infectious bronchitis in fowls, G. Kernohan (*California Sta. Bul. 494 (1930), pp. 22, figs. 2*).—This is a summary of information on infectious bronchitis, prevalent on poultry farms in California, and based upon a review of the literature and work conducted at the Petaluma poultry disease laboratory. It has been observed in chickens, turkeys, pigeons, and ducks and in wild quail, sparrows, and blackbirds, and is entirely distinct from chicken pox. The causative agent of the disease has not been identified, although its presence can be demonstrated in the tracheal exudate of affected fowls but not in other organs. It is thought to be caused by a filtrable virus, but attempts to reproduce the disease by inoculation with sterile filtrates proved unsuccessful.

Fowls that had recovered from the disease appeared to have an immunity sufficient to protect them from infection for at least a year. Attempts to immunize fowls against the disease by subcutaneous injection of tracheal exudate which had been treated with phenol, formalin, glycerin, or chloroform, or by intratracheal injection of minute amounts of virulent material were unsuccessful. The treatment of diseased fowls by intratracheal injection of antiseptics not only failed to benefit the fowls but in many instances hastened their death. Vaporizing coal tar disinfectant in poultry houses occupied by an infected flock did not check the spread of the disease nor reduce the mortality.

All domestic fowl contract Brucella disease, M. W. Emmel (*Michigan Sta. Quart. Bul., 12 (1930), No. 4, pp. 133, 134*).—Since the earlier experiments were summarized (E. S. R., 61, p. 875), numerous cases of natural infection of fowl with *B. abortus* have come to attention. These are said to have occurred principally on farms where birds were allowed to follow infected cattle and hogs or where the infected products of such animals might be consumed by the birds. The disease appeared, however, in one commercial flock in which the source was undetermined, although a complete history of the flock was available.

In a group of experiments aimed at determining the susceptibility of the turkey, pigeon, pheasant, duck, and goose to Brucella infection, one strain of each of the three forms (*B. abortus*, *B. suis*, and *B. melitensis*) was used. The results obtained indicate that all of these birds are susceptible to such infection when fed massive doses, but the rate of mortality was not nearly so high as in the fowl. The possibility that pigeons and pheasants may prove to be a means by which the organisms are spread, since they often feed in farm lots that may harbor infected animals, is called to attention.

Coccidiosis of chickens, D. E. Madsen (*Utah Sta. Circ. 86 (1930), pp. 4, fig. 1*).—This is a practical summary of information.

Further notes on Pasteurella avicida, R. Gwatkin and J. S. Glover (*Ontario Vet. Col. Rpt. 1929, pp. 56–61*).—In continuing the studies previously reported by Gwatkin (E. S. R., 62, p. 172), variations were again observed in the fermentation reactions of strains of *P. avicida* in media prepared by the addition of autoclaved solutions of carbohydrates to extract broth. Six strains produced acid in maltose and one in lactose. Six did not produce acid in mannite, but all did in saccharose.

"Only one definitely recognizable strain of *P. avicida* was isolated from the nasal chambers of 61 birds examined. It was not pathogenic for rabbits on intra-abdominal injection three days after isolation. Two other organisms isolated may have belonged to this group and were also lacking in pathogenicity for rabbits. *S[almonella] pullorum* was isolated from the nasal passages of 2 birds. It is not known whether they were reactors as they had been disposed of prior to the examination of cultures. *P. avicida* was recovered from the nasal or ocular discharges in 2 out of 5 cases of roup. The other 3 were negative for this organism by animal inoculation and culture. Very little interagglutination was observed among 23 strains of *P. avicida* when tested with three monovalent sera. Great variation was observed in the virulence of various strains and also in the power to maintain this quality under the same conditions of growth."

[Salmonella pullorum and other infections of fowls] (*Idaho Sta. Bul. 170 (1930), pp. 17, 18*).—In a comparison made of the tube agglutination test and the rapid plate test on 2,200 samples of sera, 4.6 per cent of the fowls tested reacted positively to the tube and 5.6 per cent to the rapid plate method. Qualitative and quantitative studies of the chemical nature of the constituent in fowl serum responsible for nonspecific precipitations in serological antigens indicate that precipating sera contain a significantly higher lipoidal content than do nonprecipitating sera. The data indicate that the constituents of fowl sera responsible for the nonspecific precipitations are lipo-proteins and neutral fats.

In testing 75 flocks comprising 24,500 birds for *S. pullorum* in 1929, 16 per cent of the flocks were found free from the infection. In the remaining 63 flocks, 1,043 reactors were found, or 4 per cent of the total number of birds tested. In work with ipecac for the treatment of blackhead of turkeys it was found by both oral and rectal injections in chickens that a dose of 0.025 gm. of the ether soluble alkaloids per kilogram of body weight is nontoxic.

The sera of 2,200 birds in 11 flocks submitted for diagnosis for *S. pullorum* were simultaneously tested for *Brucella abortus* with a view to determining the frequency of brucellosis in fowls. As high as 10 per cent infection was found.

Brief mention is made of a study of the blood of laying hens fed on various protein rations.

Tenth annual report on eradication of pullorum disease in Massachusetts, 1929–1930, H. Van Roekel, K. L. Bullis, and G. L. Dunlap (*Massachusetts Sta. Control Ser. Bul. 53 (1930), pp. 23, figs. 6*).—Eradication work conducted in the State in continuation of that previously noted (E. S. R., 61, p. 677) is reported upon at length, the details being given in tabular and chart form. The results of the year show the number of tested flocks and tested birds to be steadily increasing. The average percentage of infection was reduced and the number of nonreacting 100 per cent tested flocks was increased. No reactors were detected among the 584 tested fowls other than chickens, including ducks (2), geese (7), guinea fowl (3), pheasants (372), turkeys (167), and pigeons (33). Intermittent testing was not as effective in eradication as testing the entire flock each year. Early pullet testing was found practical and expedited the elimination of infection from premises. Sexual maturity of pullets did not appear to play a rôle in eradicating the disease. Infection was eliminated from many flocks within the season through intensive testing.

Brilliant green in culture media for the isolation of S. pullorum, J. S. Glover (*Ontario Vet. Col. Rpt. 1929, pp. 64, 65*).—The work conducted indicates that brilliant green is of value as an aid to bacteriological diagnosis of pullorum disease in chicks, though owing to the fact that in a small number of cases no growth occurs on the plates containing dye, cultures should be made on plain medium at the same time. An account of the use of brilliant green to facilitate the isolation of *Salmonella pullorum*, by Mallmann, Thorp, and Semmes, has been noted (E. S. R., 60, p. 374).

Isolation of S. pullorum from the nasal passages of two fowl, R. Gwatkin and J. S. Glover (*Ontario Vet. Col. Rpt. 1929, p. 61*).—In the course of a bacteriological examination of the nasal mucous membrane of 61 birds for the presence of *P*[*asteurella*] *avicida* two strains of *S*[*almonella*] *pullorum* were isolated.

Bird-malaria, C. J. Schuurman and A. M. Schuurman-Ten Bokkel Huinink (*Meded. Dienst Volksgezondh. Nederland. Indië, 18 (1929), No. 3, pp. 469–497, pl. 1*).—The authors report upon an investigation made of the occurrence of malarial parasites in different species of birds. The characteristics of the parasites found are discussed, especially with a view to the differentiation from other species. A list is given of 44 references to the literature.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Idaho Station] (*Idaho Sta. Bul. 170 (1930), pp. 12, 13*).—Studies of the use of electricity on farms, conducted in cooperation with the Idaho Committee on the Relation of Electricity to Agriculture, have shown that the saving in time and improved distribution of labor obtained with the electric motor are more important than the saving in energy costs. The washing machine is deemed "one of the greatest labor-saving devices operated by electric power."

In the structural study of farm buildings, preliminary work on scale models in the laboratory indicated that pressures below atmosphere are created under certain conditions and that such pressures may be more destructive than the straight force of the wind.

Records obtained in a study of the housing requirements of poultry show that the importance of insulation may be found in the time of occurrence rather than the control in the degrees of temperature, thus making it possible to follow lighting schedules, feeding practices, and other phases of farm flock management that fit into the most desirable periods of the day.

[Agricultural engineering investigations at the Indiana Station] (*Indiana Sta. Rpt. 1929, pp. 8–12, figs. 4*).—Studies of the use of windrow pick-up attachments for the combine indicate that the swathing method of harvesting will overcome the hazard of combining weak-strawed grain such as oats and barley. This method also makes possible the elimination of green material from the grain when combining weedy crops or those containing sweetclover. Oats combined from the windrow had an average moisture content of 10.3 per cent, while that combined direct contained an average of 14.8 per cent moisture. Records indicate that 135 acres or more must be harvested annually to make combining more economical than using the binder and thresher.

On the Paoli experimental field, having terraces with a fall of 0.3 ft. per hundred or less in the flow line, the rate of run-off was not sufficient to keep the flow line clear. Soil washed into the flow line retarded the flow of the water sufficiently to cause it to break over the terrace. Terraces with steeper gradients gave the water sufficient velocity to keep the flow line clear.

A hot-water heating system in an insulated 16-ft. shed roof poultry house maintained a temperature above 40° F. throughout the winter, while temperatures in the check pen, a standard uninsulated house, got as low as 2°. The relative humidity in the heated pen varied from 25 to 45 per cent, while that in the check pen fluctuated with the outside weather conditions, averaging approximately 85 per cent. Production in the insulated but unheated pen was slightly higher throughout the season than in either the heated pen or the check pen.

Fifty per cent more current was used by electric brooders with overhead heat than by one of the underheat types, although the mortality was approximately the same for both types. The cost with electric current at 3 cts. per kilowatt-hour is greater for electric brooders than for hard coal heated ones (hard coal at $16 per ton), with the mortality the same for both types of fuel.

A 2-roll husker-shredder can be satisfactorily operated by a 5-h. p. electric motor. The capacity of the machine when increased by a 7.5-h. p. motor does not increase in the ratio of the power increase. A 4-roll husker can be operated by a 7.5-h. p. motor but with very limited capacity at its rated motor horsepower.

Electric illumination used two hours daily during November and December increased the growth of Grand Rapids leaf lettuce approximately 15 per cent. At a cost for current of 3 cts. per kilowatt-hour the cost of lettuce was 24.9 cts. per pound.

Figures reported from a survey conducted among feed grinder owners indicate that excessive overhead may be incurred in the purchase of large grinders where the annual grinding consists of a few hundred bushels. Smaller grinders operated over a longer period of time reduce overhead costs which must be included in the cost of grinding. The results of tests conducted on the grinding of oats to different degrees of fineness show that the power cost increases rapidly as fineness increases. From 4 to 6 times as much power is required to grind oats through a $\frac{1}{16}$-in. screen as through a ¼-in. screen.

[Agricultural engineering investigations at the Massachusetts Station], C. I. GUNNESS (*Massachusetts Sta. Bul. 260 (1930), pp. 330, 331*).—In the investigation of apple storages a study of weather data and soil temperatures indicated that a common storage without artificial cooling can not be depended upon to provide sufficiently low temperatures to give proper storage for an early variety of apple like the McIntosh. The use of ice in cooling an insulated storage was found to reduce the temperature about 10° F. when fans were used to circulate air over the ice. However, under present labor conditions it is not practical to use ice for artificial cooling in competition with mechanical refrigeration.

A study of two types of broadcast fertilizer distributors indicated a great difference in the uniformity of application by the various machines.

Irrigation water requirement studies of citrus and avocado trees in San Diego County, California, 1926 and 1927, S. H. BECKETT, H. F. BLANEY, and C. A. TAYLOR (*California Sta. Bul. 489* (*1930*), *pp. 51, figs. 15*).—This is the first of a series of reports of investigations on the economic field duty of water in southern California, conducted cooperatively by the station, the U. S. D. A Bureau of Public Roads, and the California State Department of Public Works.

The results indicate that the winter water requirements of citrus groves in northern San Diego County in which cover crops of vetch or grass and weeds are grown vary from 8.6 to 12 acre-in. per acre, depending upon the size of the trees and condition of the cover crop. In the areas of northern San Diego County covered by this report, normal rainfall, when properly distributed, is adequate to meet the winter needs of both trees and cover crops. Periods of drought of more than six weeks' duration during the winter, even if preceded by heavy rains, will under conditions of cover cropping require an application of irrigation water.

Analysis of rainfall records at Escondido and Fall Brook shows that, because of deficiency in seasonal rainfall or lack of normal distribution, in at least 3 years out of 10, 1 winter irrigation, and in 2 years out of 10, 2 winter irrigations, should be provided to meet normal winter requirements of trees and cover crops. With 60 per cent efficiency in irrigation, and with 90 to 100 per cent of the soil mass moistened at each irrigation, mature citrus groves in the Escondido and Fall Brook areas have a net seasonal summer irrigation requirement of 18 acre-in. of water per acre. Similar groves in the Vista area under similar conditions require at least 15 acre-in. per acre. In fully mature groves where smaller quantities than these are available and where furrow irrigation is practiced, a correspondingly smaller percentage of the soil mass should be moistened at each irrigation. Citrus groves 6 to 8 years of age and 40 to 50 per cent of their probable ultimate size will have a net seasonal summer water requirement of 6 to 8 acre-in. per acre.

In the Sierra and Holland sandy loams 4 to 6 ft. deep, the interval between irrigations should not exceed 45 days. As the depth of soil becomes less, the interval should be shortened, soils of 2 to 3 ft. in depth requiring irrigation every 30 to 35 days, with smaller amounts of water applied at each irrigation. In properly laid out groves on rolling topography, and where care is used in the application of water, 60 per cent of the water delivered to the grove should be accounted for in soil-moisture increase in the soil mass occupied by the major rooting system of the trees. As long as the soil moisture is above the wilting point, the moisture content has no measurable effect on the rate of moisture extraction; that is, moisture is as readily available when the moisture content is one-third or two-thirds of the way between field capacity and the wilting point as it is in the thoroughly moistened soil after irrigation. In the experiments thus far completed, indications are that when the available moisture in the unirrigated portions of the soil has been exhausted, there is no apparent increase in the rate of extraction from the irrigated portions; and when the available moisture in the top foot of soil has been exhausted there is no increase in the rate of extraction from the lower depths.

Some evidence was obtained at Escondido that the quantity of water used by citrus trees may be to some extent dependent on the percentage of soil mass moistened. While this is contrary to previously accepted principles, the evidence referred to seems to warrant further investigation.

In mature citrus groves in soils 5 ft. or more in depth, an average of not more than 5 per cent of the moisture extracted was taken from the fifth foot, the mature trees having a greater range of root activity than is found in the partly matured groves. In soils less than 3 ft. in depth, 50 to 60 per cent of the root activity is in the top foot of soil. Under the same soil conditions a greater apparent moisture absorption by roots is found in the lower soil depths with avocados than is found with citrus.

Irrigation requirements of the arid and semiarid lands of the Southwest, S. Fortier and A. A. Young (*U. S. Dept. Agr., Tech. Bul. 185 (1930), pp. 68, figs. 11*).—This is the third of a series of reports on the irrigation requirements of the arid and semiarid lands of the Western States (E. S. R., 59, p. 176).

Data are presented in support of the conclusion that the area irrigated in 1919, amounting to 3,771,000 acres, may be increased to 13,000,000 acres, provided the available water supply is efficiently controlled and utilized, and the seasonal net irrigation requirements do not exceed the average quantity of irrigation water allotted to each of the 30 subdivisions into which the territory is separated.

The data include a summary of the water requirements of leading crops, and an appendix deals with the use of water on crops in the Southwest and other related matters.

Measurement of water, R. L. Parshall (*Colorado Sta. Rpt. 1929, pp. 64, 65*).—Measurements made on a 20-ft. reinforced-concrete improved Venturi flume show very close agreement with the law of discharge. For submerged-flow conditions on this flume, tests indicate a marked consistency in the relation to the computed discharge.

Geology and water resources of the Kau District, Hawaii, H. T. Stearns and W. O. Clark (*U. S. Geol. Survey, Water-Supply Paper 616 (1930), pp. IX+194, pls. 33, figs. 9*).—This report, prepared in cooperation with the Territory of Hawaii, includes a chapter on Ground Water in the Hawaiian Islands by O. E. Meinzer, and deals with the geography, geology, and water resources of the Kau District, including parts of Kilauea and Mauna Loa volcanoes.

The geologic study of the occurrence of ground water in the Kau District has shown that no perched water occurs in the basalt domes of Kilauea and Mauna Loa in the district except in association with impervious ash beds. It has been well established that as a rule the ash in the Ninole formation is the most impervious of all the ash beds and yields a supply of water that fluctuates the least. This regularity in yield indicates that the Ninole ash is more widespread and less interrupted by lava flows and erosion channels than the Pahala ash. The examination of the Kahuku, Kalae, Kapapala, and Keauhou lands resulted mainly in negative evidence regarding supplies of perched ground water.

Pure water is essential to health, W. L. Mallmann (*Michigan Sta. Quart. Bul., 12 (1930), No. 4, pp. 134–138*).—Practical information is given on the quality of farm water supplies from different sources. The method of collecting water samples for bacteriological examination used by the station is briefly described, and a copy of the questionnaire is included.

Erosion and silting of dredged drainage ditches, C. E. Ramser (*U. S. Dept. Agr., Tech. Bul. 184 (1930), pp. 55, pls. 22, figs. 24*).—The results of observations and cross-sectional and hydraulic measurements made between 1913 and 1921 on 22 dredged drainage ditches in Mississippi, Tennessee, and Iowa are reported.

It was found that little erosion of alluvial clay soil occurs where the velocity is much less than 3 ft. per second. The greatest erosion in a channel occurs in connection with the maximum velocity. In the absence of backwater conditions the maximum velocity in a channel occurs with the highest stage. Silt is transported by a stream in suspension and by rolling along the bottom It is believed, however, that rolling plays a minor part in the movement of silt in most drainage ditches.

It appeared that both erosion and silting took place in many of the channels, and that silting occurred where the normal velocity was much greater than that obtained by the Kennedy formula for the particular depth. Even though the conditions of caving banks and growth of vegetation were eliminated by proper side slopes and systematic maintenance, it is not believed that Kennedy's formula would be applicable to the design of drainage channels where there are generally such great variations in the velocity. It was also found that the highest velocities are not always in the channels with the greatest fall.

Data are also presented on conditions affecting erosion and silting in a channel, and a practical application of the results is described.

Mole drainage tested in Michigan soils, O. E. Robey (*Michigan Sta. Quart. Bul., 12 (1930), No. 4, pp. 139–141, figs. 2*).—The results of these tests indicate that the mole drains are not very durable, yet there may be a place for this type of drainage in combination with tile or open ditches. By putting in tile lines at intervals of 8 to 10 rods and crosshatching these with mole lines, the water would be materially assisted in flowing toward the tile. The same scheme might be used to hasten the drainage on more intensively drained land that is too dense to drain readily. Putting in the moles should have the effect of breaking up the hardpan and establishing new lanes for the drainage water to follow. The operation of moling is comparatively cheap, probably not costing more than $2 per acre when the lines are spaced 2 rods apart.

Progress report on draft of plows used for corn borer control, W. Ashby (*U. S. Dept. Agr., Bur. Pub. Roads [1930], pp. 33, pls. 2, figs. 4*).—This is a preliminary report of experiments which included a series of tests with 22 standard plows at 6-in. and 21 at 8-in. depths on clay loam soil, tests of 10 standard plows at 6-in. depth at speeds of 2.5 and 3.25 miles per hour, tests of a convertible 1 to 3 bottom plow, tests of various plow attachments, and miscellaneous tests of small groups of plows.

Variations in soil resistance affected the draft of plows tested more than any other factor. Draft ranged from less than 5 lbs. per square inch of furrow slice on sandy loam soil in good working condition to 15 lbs. per square inch of furrow slice on dry clay loam. In one field of clay loam soil the average draft varied from 9 lbs. per square inch when the soil was moist to 15 lbs. per square inch when very dry. Packing of the soil by tractor wheels increased the draft on moist soils to a marked extent. Disking and rolling before plowing increased the draft on moist soils but not on dry soils.

The average plow with a rear wheel giving full support apparently pulled 7 per cent easier than a simillar plow with no rear wheel when other factors were held constant. Drawbar pull due to weight of plow was apparently 18.5 lbs. for each 100 lbs. of weight. Plows with high slope coefficient or wide, low wing of mold pulled somewhat heavier than those with opposite characteristics when other factors were constant. These qualities are associated with good coverage and indicate that good covering ability usually is accompanied by a moderate increase in draft. Width of waist, another index of covering ability, did not appear to affect draft.

On clay loam soil, which had been plowed to a depth of more than 8 in. for several years, draft did not increase in proportion to depth of plowing. Drawbar pull at 8-in. depth averaged only 15 per cent more than at 6-in. depth. When the plow penetrated below the old plow sole results were very erratic.

The average draft of 10 plows increased 8.6 per cent with increase of speed from 2.5 to 3.25 miles per hour. Coulter, jointer, and covering wires seem to absorb between 10 and 15 per cent of the total power required to draw the plow.

The data and analysis indicate clearly that packing by machinery was a major factor in the draft of plows in this series of tests, since total draft increased by 10.5 per cent as the proportion of plowed earth packed by the tractor wheel increased from 32 to 72 per cent, with other factors held constant. An increase in weight of plow from 3 lbs. per square inch of furrow slice to 5 lbs. per square inch increased the draft by 3.5 per cent.

Factors affecting the mechanical application of fertilizers to the soil, A. L. Mehring and G. A. Cumings (*U. S. Dept. Agr., Tech. Bul. 182* (*1930*), *pp. 96, pls. 18, figs. 26*).—The results of studies of the drillability of fertilizers and of the construction and operation of fertilizer distributors are reported. These results showed that drillability of fertilizers is profoundly affected by changes in the relative humidity of the atmosphere in which they are stored and only slightly by differences in temperature.

Drillability is not necessarily affected by changes in absolute humidity. The effects of relative humidity and temperature operate through the moisture content of the fertilizer, and their extent depends upon the hygroscopicity of the fertilizer. All fertilizers tested are drillable at relative humidities below 50 per cent, but no fertilizer remains drillable when exposed to a humidity above its hygroscopic point.

Fertilizers containing a considerable proportion of material finer than 200 mesh are unduly dusty when dry and when slightly damp are undrillable in most distributors. Fertilizers containing not less than 90 per cent of material between 5 and 80 mesh in size usually are drillable at all humidities 5 per cent or more below their hygroscopic points.

When a mixed fertilizer is heterogeneous with respect to the size, shape, or specific gravity of the particles of its components, the materials separate more or less during distribution, and the ratio of the plant-food elements delivered may change markedly from time to time. The drillability of a fertilizer varies inversely with the kinetic angle of repose. Fertilizers with a kinetic angle of repose greater than 55° usually are undrillable. Fertilizers with an angle of repose of about 40° and composed of 20-mesh rounded grains with rough surfaces are best adapted to present types of distributors.

Distributors deliver by volume rather than by weight, hence their delivery rate by weight varies with the apparent specific gravity of the fertilizer. Delivery rate from bottom-delivery machines also varies greatly with changes in drillability of the fertilizer, changes in depth of the material in the hopper, and differences in the inclination of the distributor. The amount of low-drillability fertilizer discharged depends to a great extent upon the amount of positive action of the mechanism. Variations in delivery rate due to changes of head are greatest when the depth of material is low. Tilting a distributor toward the discharge opening increases delivery rate, and vice versa. Delivery rate by volume does not vary in top-delivery distributors. The uniformity of distribution varies with the design and mechanical refinement of the distributor and with the drillability of the fertilizer. Cycles and impulses of delivery are the principal causes of the irregular distribution of free-flowing fertilizer. Fertilizers of low drillability are delivered unevenly by all types of distributors.

Combine harvester threshers in Michigan, E. C. Sauve (*Michigan Sta. Spec. Bul. 198* (*1930*), *pp. 19, figs. 8*).—The results of field tests and observations of combine operations are reported. These were supplemented by a questionnaire.

At the completion of the 1929 grain harvest, 54 combines were known to have been used in Michigan. In 1928 there were 33, while in 1927, the first year of combine use, there were 7 combines in the State. The total average acreage harvested during the 1929 harvest by the 10-ft. combines was 156 acres, 28 per cent of this being custom work. The average capacity of the 10-ft. combine was approximately 2 acres per hour.

Shattering of the grain, particularly wheat, due to leaving it stand for the combine, was small. The time allowed after the binder harvest date before combining was 1 to 2 weeks. Heavy winds, hail, and rain are hazards the combine user must face, but the development and more general use of the windrower seems to be a solution to this problem. During the 3 years of combine use, the 1928 harvest was the most unsatisfactory because of excessive green material in the grain. Some grain harvested with the combine was not accepted by the elevators as marketable. Unevenness of ripening has not seriously reduced market quality. During the 1929 harvest, 9 of 28 owners who reported conserved a part of the straw by using a hay loader or buckrake, hauling to the barn, or baling in the field.

Under favorable weather conditions, the combine, when properly equipped with a regular bean cylinder and concaves with proper speed reductions and sieves, will do a satisfactory job of harvesting and threshing navy beans, either as a stationary outfit in the field or in motion by using a windrow pick-up. The presence of stones is a hindrance to successful operation.

The estimated cost on an acre basis for harvesting grain with a 10-ft. combine with separate motor and 2 men is $2.82 per acre. This cost is based on an average yearly acreage combined of 156. Where a windrower and windrow pick-up are used, the additional operation of windrowing will cost about $1 an acre, the cost being based on the average acreage now harvested by combines in Michigan.

Drying combine harvested rice on the farm, W. D. Smith, J. J. Deffes, C. H. Bennett, and W. M. Hurst (*U. S. Dept. Agr., Bur. Agr. Econ., Grain Invest.* [*Pub.*] *57* (*1930*), *pp. 20, figs. 7*).—The results of tests, carried on in cooperation with the Bureau of Public Roads of this Department, of combining and drying rice in commercial driers are reported and practical information given on these processes.

The data show that the average operation cost for power, labor, and fuel for individual drying operations for several different lots and varieties of rice averaged about 0.45 ct. per bushel. As each lot was dried about four times, the total operation cost averaged about 1.8 cts. per bushel.

Grain drying by forced draft with heated air, W. M. Hurst and R. C. Miller (*U. S. Dept. Agr., Bur. Pub. Roads, 1929, pp. 10, pls. 2*).—Studies conducted in cooperation with the North Dakota Experiment Station are reported.

The results showed that wheat, oats, barley, rye, and buckwheat can be dried by forced draft with heated air but that considerable time is required for the process. The exact time required depends in part upon the air conditions and the initial moisture content of the grain. Under the most favorable drying conditions secured, 40 to 60 minutes were required to reduce the moisture content of wheat from 18 to 14 per cent. Similar results were obtained in drying barley, rye, and buckwheat, but oats required considerably less time to dry than any of the other grains.

The number of heat units supplied in drying the different crops seemed to depend largely upon the quantity of water evaporated. Regardless of the kind of grain or the initial moisture content, there appears to be no great difference in the average number of heat units supplied per pound of water evaporated under test conditions.

With coal at $12 per ton, the equivalent cost of fuel per bushel of grain dried was approximately 1.6 cts. for wheat, 0.7 ct. for oats, 1.7 cts. for barley, 1.3 cts. for rye, and 1.5 cts. for buckwheat on the assumption that 50 per cent of the potential heat units are utilized from coal with a heat value of 12,000 B. t. u. per pound. The net increase in market value of three lots of wheat, due to the increase in test weight and decrease in moisture content, approximated 11, 17, and 16 cts. per bushel, respectively.

The rate of drying or the temperature of the drying air seemed to have little effect on the weight per bushel of the grain at any given moisture content. The weight per bushel of artificially dried grain was practically the same as samples of the same grain dried under atmospheric conditions.

Artificial drying by forced draft with air at 120, 140, and 160° F. did not seem to affect the germination of the grain, nor were the milling and baking qualities of wheat impaired.

Silage and silo construction, R. H. Lush and H. T. Barr (*Louisiana Stas. Circ. 2 (1930), pp. 20*).—Practical information is presented on silage and silage making and on silo construction.

Pit silos, T. P. Metcalfe and G. A. Scott, rev. by W. H. Black (*U. S. Dept. Agr., Farmers' Bul. 825, rev. (1930), pp. II+8, figs. 4*).—This is a revision and condensation of this publication (E. S. R., 37, p. 789).

Creamery organization and construction, H. Giese and M. Mortensen (*Iowa Sta. Bul. 267 (1930), pp. 101–132, figs. 14*).—This bulletin, which apparently supersedes Bulletin 139 of the station (E. S. R., 30, p. 89), briefly discusses creamery organization and construction, contains plans of different creameries, and gives a complete set of specifications governing their construction.

Electric brooders, F. E. Price, A. G. Lunn, and F. E. Fox (*Oregon Sta. Bul. 262 (1930), pp. 24, figs. 16*).—This bulletin, prepared in cooperation with the Oregon Committee on Electricity in Agriculture, presents the results of experimental work with electric brooders to determine power requirement, rate of growth, quality of the chick, mortality, and convenience and dependability in the operation of various types of electric brooders.

The cost of heat for brooding chicks was found to be approximately the same when using electric brooders of good construction at the rate of 3 cts. per kilowatt-hour as when using a coal stove with briquets at $17 per ton. The labor required in operating electric brooders is much less than for coal-stove brooders.

Well-constructed electric brooders automatically maintain a very uniform brooding temperature. Electric brooders should have sufficient heating capacity to maintain a temperature of 100° F. with no chicks under the hover during the coldest brooding weather. They may be equipped with full automatic heat control or may have only part of the heating elements equipped with automatic control and the remainder with a hand snap switch control. Full automatic heat control is decidedly superior. They do not require supplemental room heat when the outside temperature is only slightly below freezing. Chicks were brooded successfully with electric brooders without supplemental room heat with an outside temperature as low as 4° above zero.

A roosting platform of 0.5-in. mesh hardware cloth supported by a frame of 1 by 3 in. lumber on edge is recommended to provide a sanitary roosting place. Electric brooders should provide under the hover 7 sq. in. per chick and 12 sq. in. per poult.

Electric brooders eliminate a fire hazard that exists when using fuel-burning brooders. Power interruptions of one to two hours will not injure the chicks if proper management is followed. There is a large variation in different types and makes of electric brooders, and some are more satisfactory than others.

A section on electric brooding of turkeys is appended.

Principles of box and crate construction, C. A. Plaskett (*U. S. Dept. Agr., Tech. Bul. 171 (1930), pp. 134, pls. 42, figs. 34*).—This bulletin brings together the various principles involved in efficient box and crate construction and shows their interrelation. These principles are based on extensive investigations at the Forest Products Laboratory, supplemented by study and observation of shipping containers in service.

Particular attention is given to the kinds of failures to which each type of container is subject, and to the changes in construction that will overcome these failures or render their recurrence less likely. Broad distinctions among various classes of commodities and conditions of service are discussed.

A brief discussion of the principles of internal packing, together with some examples of their application, is included. Eight appendixes present information on the characteristics of the principal woods available for box and crate construction, the seasoning of lumber, container testing, formulas for the design of boxes, and standard specifications for boxes of various kinds.

A foreword by J. A. Newlin is included

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Indiana Station, 1928–29] (*Indiana Sta. Rpt. 1929, pp. 42–45, figs. 3*).—A study in 1927 and 1928 of binder thresher and combine harvester thresher costs showed that with acreages of from 130 to 140 acres the costs were approximately the same. For smaller acreages the binder thresher method was the cheaper.

Annual upkeep cost of fences on 30 farms in the west-central part of the State was found to be 18 cts. per rod.

A group of farms in the central part of the State operated by tenants under the supervision of a manager was found to have returned on an average of 6.4 per cent on the total investment for the period 1918–1927.

A land utilization study in Washington County showed that timothy or timothy and redtop pastures carried only about 50 per cent as much livestock as sweetclover or red clover and timothy pastures. Bluegrass was found to be superior to timothy.

The cost of government in Massachusetts, 1910–1926, H. W. Yount and R. E. Sherburne (*Massachusetts Sta. Bul. 256 (1929), pp. 167–234, figs. 11*).—This is the second of the series of studies on taxation and public finance made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., previously noted (E. S. R., 57, p. 384). Data are presented and discussed showing the expenditures of the State, counties, cities, and towns of different sizes for different purposes, 1910–1926 (some small towns not included, 1910 and 1911); the causes of the increases in expenditures; how revenues have been obtained; the costs of similar governmental activities in different governmental units and the benefits from public expenditures in farm and urban communities; and to what extent State financial aid is reducing tax burdens in agricultural towns.

The total expenditures in 1926 were $356,971,000, an increase of 157.2 per cent over 1912. Of the total expenditures in 1926, the percentages expended by different governmental units were for State 13.9, counties 2.8, towns under 5,000 population 6.7, towns with over 5,000 population 15, and cities 61.6. The following table shows the total expenditures in 1926 for different purposes and the increases from 1912 to 1926 in expenditures for different purposes in different governmental units:

Total expenditures in Massachusetts, 1926, for different purposes and percentages of increase, 1926 over 1912, in different governmental units

	Total expenditures 1926	Percentage increase 1926 over 1912					
		Central State government	Counties	Towns under 5,000	Towns over 5,000	Cities	Total
Interest and debt	$46,265,000	30.6	[1] 103.8	72.9	89.1	81.6	77.6
Highways	59,661,000	360.7	330.4	239.9	246.7	167.7	220.8
Education	93,621,000	249.5	540.2	172.2	267.0	244.9	241.9
Charity, health, and correction	65,550,000	112.9	160.2	120.6	211.5	175.8	156.5
Other general expenses	65,956,000	55.1	141.2	170.7	143.3	148.0	123.7
Public service enterprises	25,341,000	--------	--------	85.9	188.3	117.1	128.7
Total	[2] 356,971,000	132.5	183.5	147.3	193.6	157.0	157.2

[1] Payments on debt not included.

[2] Includes $577,000 for waterways.

The sources of funds to meet increasing expenditures and the public debt are also discussed.

The cost of local government in Larimer County, Colorado, G. S. Klemmedson (*Colorado Sta. Bul. 361 (1930), pp. 84, figs. 12*).—This study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., covers selected years from 1920 to 1928. Analysis is made of the revenues and expenditures of the county and of the costs under the existing legislation and fiscal management. Suggestions are made as to methods for bringing about improvements. It is concluded that "the whole system of county government needs to be reorganized and simplified."

Methods of research in forest taxation, R. C. Hall (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 8 (1930), pp. [3]+8*).—The purposes and scope of the different projects in which the Forest Taxation Inquiry is engaged, the data collected, and the methods used under each are described.

Preliminary set of tables relating to forest taxation in New Hampshire, with explanatory notes and definitions (*U S. Dept. Agr., Forest Serv., 1930, pp. 6+[45]*).—Tables are given showing for the towns of Fremont, Loudon, and Richmond for 1928 (1) by property, value, and area classes the number of owners and properties, acreage, assessed value of real estate, estimated assessed value of merchantable timber, and estimated volume of softwood and hardwood timber, (2) by property, value, and area classes the area and appraised value of land and young growth, buildings and improvements, merchantable timber, and all real estate, (3) ratios of areas and appraised values of forest and nonforest lands by property classes, (4) areas of forest land and appraised values per acre of bare land, young growth, and merchantable timber by property classes, (5) area, volume, and appraised value of softwood stands and all forest stands, (6) relation between assessed and appraised values of real estate by property, value, and area classes, (7) distribution of properties by property, value, and area classes by ratio of assessed to appraised value, (8) existing distribution between property, area, and value classes of assessed values and changes in distribution resulting from excluding merchantable timber values and substituting appraised for assessed values, and (9) the existing distribution of taxes between property classes and changes in distribution resulting from excluding merchantable timber values and substituting appraised for assessed values.

The forest counties of Minnesota: Tax base (continued), tax rates, and tax burden on wild land, H. H. Chapman (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 5 (1929), pp. [4]+28, figs. 4*).—The discussion of the tax base previously noted (E. S. R., 60, p. 828) is continued, and tax rates and the tax burden on wild land are considered.

Digest of State forest tax laws enacted or revised during the calendar year 1929, L. S. MURPHY and P. A. HERBERT (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 7* (*1930*), *pp.* [*3*]+*16*).—Included are a brief statement of the essential features of the special forest tax laws enacted or revised by the States during 1929 and a revision of the comparative table previously noted (E. S. R., 62, p. 342), bringing the condensed statements of important provisions of State forest tax laws up to December 31, 1929.

Shifts in farming in the United States, W. J. SPILLMAN (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. 87, figs. 114*).—This mimeographed preliminary report presents maps of the United States with explanatory text, showing by counties the percentage of total land area in crops in 1919 and the percentage change, 1919 to 1924, the percentages of total crop acreage in different field crops (with broomcorn, emmer, spelt, and dry peas omitted in 1924 and velvetbeans in 1909), vegetables, grapes, nuts, strawberries, and tropical fruits in 1909, 1919, and 1924; apples, peaches, pears, and plums and prunes in 1924, and changes in number of trees, 1910 to 1920 and 1920 to 1925; the numbers of beef cattle, dairy cattle (1920 only), chickens, goats, and sheep per 1,000 acres of farm land in 1920 and 1925; the percentage of change in milk production, 1919 to 1924; the number of horses and mules per 100 acres of crops, 1920 and 1925; and the percentage mules were of total horses and mules in 1925.

The important shifts of crops and enterprises are discussed briefly.

Cropping systems in Iowa, past and present, E. B. HURD (*Iowa Sta. Bul. 268* (*1930*), *pp. 133–163, figs. 23*).—The geography of the cropping system is described and the changes since 1900 and the future system discussed. Included are maps showing by counties and townships for 1925 the percentages of grain land; of crop land, including pasture, in small grain, in corn, and in grain; of grain land in small grains; and of small grain land in oats, barley, and winter wheat; the crop acreages of the State; comparisons of grain yield trends, 1899 to 1928; and the percentages of crop area in corn and small grain in 1899, 1909, 1919, and 1928. Charts are included showing the contrasts between the variation in type and the amount of small grain by townships in 1925 and between the variation in type of grain and the percentage of crop land in grain by townships in 1925; the relationship between average yield per acre of oats, 1918 to 1927, and the percentage of grain land in small grains by counties; the relationship between the tillable land in farms and the percentage planted to grain crops in 1924; and a comparison of farm price trends of Iowa grains, 1900 to 1930.

Corn borer affects farm management, P. G. MINNEMAN (*Michigan Sta. Quart. Bul., 12* (*1930*), *No. 4, pp. 152–155*).—The size, improvements, equipment, power and labor set-up, crop practices, and crop and livestock organization of 205 farms selected in 5 southeastern counties of the State chosen for a 3-year study, in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of the changes in farm organization and operation taking place because of the corn borer are described.

Variations in crop production costs in Medina County, Ohio, F. L. MORISON (*Ohio Sta. Bul. 453* (*1930*), *pp. 52*).—Analysis is made of the crop production costs, 1920–1924, inclusive, for different crops on 23 farms. The data were obtained by the route method from records kept by the farmers. The variations between farms and years and the effects of such factors as size of farm, use of tractors, date of planting, methods of harvesting, yields, etc., on costs for each crop are analyzed and discussed.

Efficiency in dairying, F. B. HEADLEY and C. VENSTROM (*Nevada Sta. Bul. 118* (*1930*), *pp. 18, figs. 4*).—Included are three papers originally published in the monthly News Bulletin of the department of farm development of the station as follows: Efficiency in dairying—discussing the costs of keeping a dairy cow, labor requirements of dairy herds, the effects of investment in buildings and equipment and of butterfat produced on earnings or profits, how butterfat production may be increased, and profitable feeding methods; making the dairy herd efficient—discussing overhead expenses, feeding, labor costs, total expenses, and returns; and farm relief for dairymen—giving results of culling cows on profits.

Factors involved in buying Missouri cream, F. L. Thomsen and W. H. E. Reid (*Missouri Sta. Research Bul. 137 (1930), pp. 26, figs. 10*).—This bulletin discusses and summarizes certain procurement factors—station purchases versus direct shipments, efficiency of stations, volume of business, number of competing stations, distance to plant, location of station, status of operator, shortage, and grades of cream—developed in connection with the study previously noted (E. S. R., 61, p. 887).

Costs of cooling milk on farms, R. B. Corbett (*Rhode Island Sta. Bul. 223 (1930), pp. 13, fig. 1*).—This bulletin is based upon 159 replies to questionnaires sent representative dairymen and data obtained in personal visits. The average costs per 100 lbs. of milk in 1929 with different systems of cooling were: Ammonia, 4 farms 14.3 cts.; electric with wet tanks, 19 farms 12.68 cts.; electric with dry boxes, 11 farms 14.26 cts.; and with ice, 50 farms 10 cts. Item costs with the different systems are included.

Volume of milk and proper insulation of cold chambers were the chief factors affecting costs.

Economic aspects of the Washington fruit industry: Apricots, cherries, peaches, and pears, N. W. Johnson (*Washington Col. Sta. Bul. 238 (1930), pp. 72, figs. 13*).—The present status of production and trends in plantings in Washington and competing States are discussed. Based on data obtained from approximately 200 growers through interviews during the summers of 1927 and 1928, tables and charts are presented showing the average costs by items of producing each of the fruits in the Wenatchee and Yakima districts. The yields; average cost of production, including interest on all investments and wages for all labor but excluding depreciation on plantings; depreciation on plantings; and receipts for the four fruits are shown in the following table:

Average yields and costs of production of and receipts from soft fruits in Wenatchee and Yakima districts of Washington

Fruit	Number of farms	Unit	Yield per acre	Costs of production		Receipts
				Other than depreciation	Depreciation on plantings	
Wenatchee district						
Apricots	25	Ton	2.8	$72.06	$18.14	$79.42
Cherries	27	Pound	8,093	.058	.009	.1140
Peaches	25	Box	768	.48	.069	.6338
Pears	24	Ton	11.01	31.92	3.69	44.85
Yakima district:						
Apricots	24	do	3.45	55.35	16.11	73.92
Cherries	24	Pound	7,095	.066	.0067	.119
Peaches	26	Box	1,035	.46	.063	.608
Pears	22	Ton	11.84	24.50	2.65	44.42

Statistics and charts of the apple industry, compiled by W. H. Youngman (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. VI+99, figs. 36*).—The number and distribution of bearing and nonbearing trees; total and commercial production; car-lot shipments and unloads; cold-storage holdings; prices, by varieties, grades, and regions; exports and world trade; freight rates on apples; statistics as to canned and dried apples, cider, and competing fruits; indexes of prices received by producers compared with those for commodities purchased, etc., are presented in tables and charts.

Origin and distribution of the commercial strawberry crop, J. W. Strowbridge (*U. S. Dept. Agr., Tech. Bul. 180 (1930), pp. 104, figs. 57*).—This study of the strawberry industry covers the period 1920–1926. Tables and charts are presented and discussed showing the acreage, yield, production, and crop movement periods, by States and production districts for the period or by years; the varieties produced; distribution of shipments from the production districts; carload unloads; origin of carload shipments at principal markets; and the costs of transportation. The industry, 1920–1926, is reviewed by States.

Foreign trade of the United States, annual, 1790–1929: Sheep, mutton, lamb, and wool, C. G. Gries (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Sect. Rpt. 49 (1930), pp. [1]+39, fig. 1*).—This mimeographed set of tables showing the annual exports, imports, reexports and net balance, quantity and value, includes tables as follows: Sheep, live, 1790–1929; mutton and lamb, 1869–1929; wool, unmanufactured, 1818–1929; sheep, live, imports, inspected, quarantined and not quarantined, 1891–1929, and classified according to purpose for which imported, 1928–1929; and shipments of live sheep, 1903–1918, and mutton and lamb, 1903–1929, from the United States to Alaska, Hawaii, and Porto Rico.

International trade in pork and pork products, K. Bjorka (*Iowa Sta. Research Bul. 122 (1930), pp. 53, figs. 29*).—Tables and charts, with explanatory text, are presented showing for the period 1850–1928 the exports from and imports into the United States of agricultural products and the exports and imports of different hog products to and from different countries. The factors affecting imports and exports of hog products are discussed. No considerable amount of refined analysis is made of the data, but the following conclusions are drawn:

The foreign outlet for hog products, especially lard, supports the domestic prices and consequently the price of hogs received by producers. The periodic rise and fall in the volume of exports indicates that the export outlet serves as a buffer against the price depressions which might otherwise result from the cyclical nature of hog production in the United States. The study seems to show that the United States exportable surplus of hog products is not temporary, and that if the home market expands the increased needs will have to be met by expansion of domestic production rather than by curtailment of exports. It is also important for hog producers and others interested in the pork-producing industry to cultivate good will for hog products abroad.

Pork products in foreign trade, K. Bjorka (*Iowa Sta. Circ. 121 (1930), pp. 8, figs. 5*).—This is a popular circular, giving the findings and conclusions of Research Bulletin 122, noted above.

A partial sociological study of Dryden, New York, with special emphasis on its historical development, G. M. Kensler and B. L. Melvin (*New York Cornell Sta. Bul. 504 (1930), pp. 65, figs. 36*).—The results of a study of Dryden, a village selected as representative of villages of 500 to 749 population in the dairy farming section of southern New York, are presented. The first section of the report includes "an analysis of the population of the village according to sex and age and an examination of all agencies, institutions, and organizations in the village respecting the relative services which they render and the distribution of their membership and officers between the village and the open country." The second section traces "the history of the economic, public, professional, religious, educational, and social and recreational agencies, institutions, organizations, and activities of the village, to determine the influences of the past on the present, and the interrelationship of these various agencies both past and present."

The following conclusions and implications are made as to such villages: (1) There has been a marked change since 1900, the most rapid shifting occurring in the last 8 or 10 years. The villages are ceasing to be self-sufficient and residents are coming to depend on larger centers for certain economic goods and professional services. (2) The economic agencies are becoming more specialized. (3) Their economic success depends upon skillful adaptation to the rapidly changing needs of the surrounding farm population and the demands of the general public that can be drawn from the cities by quality service. (4) Their success is likely to depend upon definite efforts to direct the activities of the open country to themselves. (5) Farmers' cooperative organizations and industries closely related to farming can be encouraged to locate in such villages. (6) The work of the churches needs to be expanded to include a larger country area. (7) The village of this size appears to be the logical center for the central rural-school district with a 4-year high school course. (8) Leadership in organization needs to be more equally divided between villagers and open country dwellers.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

National Association of Young Farmers' Clubs: First annual report, 1929–30 (*Nalt. Assoc. Young Farmers' Clubs [London] Ann. Rpt., 1 (1929–30), pp. 24, figs. 9*).—This, the first annual report of the association, describes briefly the organization, its methods and policies, and some of the results obtained by club members.

[Exhibits at fairs] (*[Oklahoma] Panhandle Sta., Panhandle Bul. 18 (1930), pp. 7–15*).—Information is given regarding exhibiting and scoring grain sorghums, by H. H. Finnell (pp. 7–10), and horticultural crops, by F. P. Eshbaugh (pp. 10–15).

FOODS—HUMAN NUTRITION

Points for consideration in baking tests, C. G. Harrel (*Cereal Chem., 6 (1929), No. 5, pp. 414–423, figs. 4*).—This discussion of the standard baking test tentatively adopted by the American Association of Cereal Chemists is based upon the author's experimental baking and the results of the collaborative work of the preceding year (E. S. R., 62, p. 488). The personal factor in panning, lack of uniformity in greasing, and variations in oven temperature are among the factors discussed as accounting for variations in results.

Baking tests with flour from Purkof wheat (*Indiana Sta. Rpt 1929, pp. 49–51, fig. 1*).—This progress report confirms the findings noted in the previous report (E. S. R., 61, p. 386), and in addition notes that yeast bread from Purkof flour was somewhat more creamy in color and scored slightly higher than bread made from flour of standard soft wheat varieties. Purkof had a slightly higher absorption value than the other flours and yielded more bread by weight from a given weight of flour.

Manufacture and preservation of cranberry products (*Massachusetts Sta. Bul. 260 (1930), p. 358*).—In continuation of this investigation by C. R. Fellers, F. P. Griffiths, and W. W. Chenoweth, earlier conclusions concerning the better keeping qualities of canned cranberry sauce at low temperature (E. S. R., 61, p. 889) have been confirmed in the examination of the canned material after storage for a year at 90, 70, and 45° F. A good cranberry sauce was found to jell at 216 to 218°, to contain approximately 43 per cent of sugar, and to show a bloom jelly strength of about 150 gm. In attempts to develop a cranberry sirup, it was found impossible to eliminate completely a very troublesome pectinous precipitate, although the amount of precipitate was lessened by using a very short extraction period and expressing the juice before all of the pectin had been liberated. Candied cranberries made in the laboratory were considered superior in many ways to the commonly used candied cherries.

Standardization of cherry and blackberry preserves and blackberry jelly, H. Cameron and R. B. Burns (*West Virginia Sta. Bul. 234 (1930), pp. 24, figs. 4*).—This bulletin reports in detail the experimental studies leading to the development of the standard methods for the preparation of cherry and blackberry preserves and blackberry jelly noted previously (E. S. R., 63, p. 486).

Utilization of frozen fruits in ice cream (*Massachusetts Sta. Bul. 260 (1930), pp. 358, 359*).—In this progress report of a joint project carried on in the departments of dairy industry and horticultural manufactures, it is stated that two fruit crops, consisting of strawberries, raspberries, blackberries, cherries, and peaches, have been cold packed with various ratios of cane and corn sugars, stored at 15° F., and used in fruit ice cream mixes. The most satisfactory varieties of strawberries and raspberries for this purpose are listed. The optimum ratio of fruit to sugar was found to be from 2 to 1 to 3 to 1 for strawberries and cherries and 3 to 1 for raspberries and peaches. Corn sugar was found to be unsatisfactory in that it discolored the fruit. Fruits frozen without sugar lost to a considerable degree their characteristic fresh flavor and color. When frozen with sugar at 0°, followed by cold storage at 15°, the fruit kept in good condition for over a year and compared favorably with fresh fruit for use in ice cream, jams, jellies, and juices.

An economic study of food consumed by farm and village families in central New York, F. M. Williams and J. E. Lockwood (*New York Cornell Sta. Bul. 502 (1930), pp. 52, figs. 2*).—In this investigation of the cost of adequate diets for farm and village families in the State, the method selected as most feasible was the collection of day by day accounts for a four weeks' period of all of the food consumed by 100 or more families who were economically independent and in good health, but of widely varied economic status. The food items were recorded by weight and accompanied by an account of money expenditures of the families. Attention was paid to edible food taken into the house and not eaten by the family, to meals eaten by members of the family away from home, and to guests entertained in the home. Supplementary information was secured on the composition of the family by age, sex, height, weight, and occupation, on cash or credit payments for foods, and on brands of foods purchased.

The records were spread through the period from October, 1925, to June, 1927, including all seasons, but avoiding holiday periods. Of the 106 records found complete enough to use, 42 came from village and 64 from farm families. After the diet analyses had been completed it was found that 18, or 43 per cent, of the village families and 41, or 64 per cent, of the farm families were adequately fed according to the standards adopted. These standards are discussed in considerable detail, with emphasis on the fact that different opinions are held as to the standards of nutritional adequacy and that whenever the term adequate diet is used the reference is to the particular standards adopted.

In calculating food costs, the problem of evaluating in terms of money the food produced on the farm or in the garden was settled by charging the family and crediting the farm and garden with the wholesale prices which the family would have obtained if the foods produced had been sold in a neighboring market. In calculating the cost of fruits, vegetables, and meat canned by the family the wholesale price of materials was used.

For the purpose of comparing the findings with those of other studies, the energy values were calculated in terms of the so-called adult male unit. Since the average weight of the men in the 106 families studied was 165 lbs. and the energy requirement of a man of this weight engaged in moderately heavy muscular work is 3,400 calories, this figure was taken as the unit in terms of which the energy requirements were stated.

Because of the fact that adequate diets for children are more expensive per calorie than those of most adults, another scale was devised in terms of the money value of low cost adequate food budgets for persons of different ages, sizes, and occupations at prices prevailing in central New York villages. The methods used in preparing these units are discussed and tables given of the money value of adequate diets for persons with different food requirements and of the adequate-food-cost units and energy units for adults and children with energy requirements varying by 100 calories from 2,000 to 4,800, and from 950 to 3,400 calories, respectively.

The money expenditures of the 41 adequately fed farm families and 18 adequately fed village families have been tabulated in terms of energy units, of adequate-food-cost units, and of food consumed by a family of five. A comparison of these tables shows a wider range of money expenditure among the village than among the farm families. In the village families there was no distinct grouping in price, while among the farm families 18 out of 41 spent between 20 and 29 cts. per adequate food-cost unit or an average of 23.7 cts. per day. The range of expenditure per adequate-food-cost unit was from 10.2 to 50.5 cts. for the farm families and from 31.7 to 71.3 cts. for the village families. Of the total number of adequately fed families, including both farm and village, 12, or 20 per cent, were consuming food valued at less than 50 cts. per energy unit per day.

The wide differences in money expenditure for adequate diets were attributed partly to the differences in amount of food produced by the family in farm or garden, in small degree to seasonal differences, and to a considerable extent to a higher calorie consumption than necessary. The average calorie consumption of the adequately fed families in terms of the estimated requirement of 3,400 calories was 4,048 for the farm families and 4,659 for the village families. In the 16 adequately fed families whose actual calorie consumption conformed closely to the estimated energy requirement (average 3,320 calories as compared with the standard 3,400), the average retail value of the food consumption per adequate-food-cost unit per day was 52.9 cts., a value closely approximating the calculated retail value of an adequate food budget, 49.4 cts.

"Taking into account all the adequately fed families and disregarding the calorie consumption in relation to the calorie requirement, there were 10 adequately fed farm families and 2 adequately fed village families with food consumption valued at retail at less than 50 cts. per adequate-food-cost unit per day. With the exception of March, July, September, and December, each month was represented by at least 1 of these 12 families. It is evident that to maintain such an economical standard requires careful planning, the elimination of waste, and a reduction of the consumption of sweets below the average now existing in this section of New York. It is evident also that, for the farm family in particular, it is possible to reduce money expenditure for food far below the level of 50 cts. per adequate-food-cost unit per day, by utilizing home-produced milk, meat, eggs, fruit, and vegetables.

"The average difference between the wholesale and the retail value of food produced on the farm and consumed by the adequately fed farm families is found to be 11.4 cts. per adequate-food-cost unit per day. The corresponding figure for the adequately fed village families is 5.5 cts. In terms of an annual family budget these figures indicate an important addition to income."

An appendix contains a large number of useful tables, based upon the present investigation, including adequate low cost food budgets in appropriate steps from that of a child about 12 months old to an adult requiring about 4,600 calories daily.

Food service in Massachusetts rural elementary schools, E. DAVIES (*Massachusetts Sta. Bul. 263 (1930), pp. 51–69, figs. 2*).—This complete report with regard to food service of the investigation noted previously from a preliminary report (E. S. R., 61, p. 891) is based upon data secured in personal visits to the schools of 155 towns of less than 5,000 population and correspondence with school superintendents in 67 similar towns. The 222 towns included in the survey had a total enrollment of 57,600 pupils, housed in 800 school buildings of which 370 were one-room one-teacher buildings, 208 buildings of two or three rooms, and the remaining 222 of four or more rooms. Over 15,000 pupils attended schools so far from home that transportation was provided. These and 1,000 children walking to school from a considerable distance remained in the school buildings for their midday meal.

In 567 of the 800 buildings there was no food service of any sort, in 185 some hot drink or soup was served during the winter months, in 23 a meal was served during the entire year, and in 25 milk alone was served either as a midmorning lunch or at noon.

As arguments for the need of school supervision of the children's lunch, the author reports on the number of absences due to digestive disorders, which were proportionately more frequent among the children who rode to school than among those who walked and went home to lunch, and also on the content of the children's box lunches. In 78 per cent of the lunches no milk, cocoa, or soup was provided and in 93 per cent no hot food of any kind. Cake or pie or both figured in 69 per cent of the lunches.

To give the best idea of the foods served, the methods of financing, and the equipment in the different types of schools, various existing services are described, beginning with a one-room school located in the country without conveniences of any kind beyond a flat-top stove that could be used for simple cooking, and ending with a six-room six-teacher building with a well-equipped lunch room serving from 100 to 115 pupils well-planned lunches at a flat rate of 15 cts. per child per day. The various services described show that while the type is limited by the physical equipment of the building, no building was too poorly equipped to make some sort of hot-food service possible even if it consisted in nothing more than in heating in a wash boiler individual glass jars of food brought by the children from their homes.

The amount of midsession food service, as noted earlier, was very small, and in every instance milk was the only food served. In discussing such service, the author calls attention to the difference between midmorning and midsession and suggests that the frequent objection to such service on the ground that it spoils the pupil's appetite for lunch can be explained through the fact that the usual time for serving milk is at midsession or recess, between 10.30 and 11 or very near the noonday meal. Midmorning, half way between breakfast and the noon meal, is in general about 9.30 and this is the time at which it is considered that supplementary feeding should take place.

The basal metabolism of young college women in Florida, J. TILT (*Jour. Biol. Chem., 86 (1930), No. 2, pp. 635–641*).—Basal metabolism data obtained with the Sanborn-Benedict apparatus on 52 subjects from 17 to 25 years of age at the Florida State College for Women gave average values 9.9 per cent below the Harris-Benedict standards and 10.6 per cent below the Aub-Du Bois standards. It is noted that these values are lower than those reported by Gustafson and Benedict for Wellesley College students (E. S. R., 60, p. 392) and suggest a lowered metabolism in the South. In a few determinations in which a seasonal comparison could be made there appeared to be no change with season, nor was the metabolism higher in a group of students engaged in more vigorous physical exercise through being majors in the department of physical education.

[Vitamin C in Idaho potatoes] (*Idaho Sta. Bul. 170 (1930), p. 22*).—It is noted in this progress report (E. S. R., 61, p. 896) that young growing potatoes when cooked are richer in vitamin C than cooked mature potatoes either before or after storage.

Beef extract as a source of vitamin G, R. Hoagland and G. G. Snider (*Jour. Agr. Research [U. S.], 40 (1930), No. 11, pp. 977–990, figs. 7*).—In this investigation at the Bureau of Animal Industry, U. S. D. A., commercial beef extract from five different establishments was tested on rats as a source of vitamins B (F) and G, and of G alone. When fed as the sole source of both vitamins B and G, there was uniform failure to grow, but when vitamin B was furnished in the form of an alcoholic extract of white corn meal good to excellent growth resulted following the addition of the moisture-free beef extract at a 7.5 per cent level. This was true of the extracts from four of the five establishments, while that from the other establishment was slightly less satisfactory. With dried lean beef as the source of vitamin G, 25 per cent sufficed for excellent growth. It is estimated that 1 lb. of concentrated beef extract contains approximately the same amount of vitamin G as 11 lbs. of fresh lean beef, and it is suggested that it may be more effective in the treatment of human pellagra than fresh beef.

The relation of diet to health and disease, E. Mellanby (*Brit. Med. Jour. No. 3614 (1930), pp. 677–681*).—In this lecture the author discusses his theory that foods commonly eaten contain both protective elements (vitamins) and harmful elements (toxamins) on the basis of (1) rickets and dental caries, (2) degenerative changes in the nervous system, and (3) the susceptibility of human beings to infection of the lungs, ears, nasal sinuses, genito-urinary tract, etc.

As evidence in support of the antagonizing factor for vitamin D, the author refers to studies of Green and Mellanby (E. S. R., 59, p. 292) and those of M. Mellanby (E. S. R., 63, p. 391). In discussing the degenerative changes in the nervous system, hitherto unpublished studies are reported indicating that ergotism of the nervous system can be prevented in human beings by the addition of sufficient vitamin A to the diet, and that the nerve toxin in ergotized rye germ is present, although in lesser amounts, in normal rye and other cereal grains and even in white flour. The possibility is suggested of a similar cause for lathyrism, a nerve disorder found on a large scale in the North-Western Provinces of India, for pellagra, and for cord degeneration in pernicious anemia. The possibility is suggested that "both the blood changes and the cord degeneration in pernicious anemia are due to failure on the part of the liver, the blood condition being due to the exhaustion of some specific water-soluble substance and the cord changes to a deficiency of a specific fat-soluble substance, maybe vitamin A as discussed above. Only further work will show whether pernicious anemia has a positive dietetic causation similar to that found in cereals which produces nerve degeneration."

The discussion of infections is based upon the previously noted studies of Mellanby and Green on the cure of puerperal septicemia by vitamin A concentrates (E. S. R., 62, p. 294).

The toxicity for laboratory animals of high doses of irradiated ergosterol [trans. title], H. Simonnet and G. Tanret (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 6, pp. 400–402*).—In this summary of the authors' studies on the subject, data are given confirming the report of Levaditi and Po (E. S. R., 62, p. 898) on the sensitivity of rabbits as compared with mice

(E. S. R., 62, p. 96) and other animals to large doses of irradiated ergosterol. Of particular interest is the statement that pregnant animals tolerated fairly large doses of irradiated ergosterol, with resulting benefit to the young in protection against rickets.

In the opinion of the authors the difference in tolerance of different species of animals to irradiated ergosterol makes it impossible to institute comparisons with human beings.

On the nature and rôle of the fatty acids essential in nutrition, G. O. and M. M. Burr (*Jour. Biol. Chem., 86 (1930), No. 2, pp. 587–621, figs. 4*).—In this report of a continuation of the investigation which had led to the announcement that a new deficiency disease can be produced by the rigid exclusion of fat from the diet (E. S. R., 62, p. 292), further observations on the nature and cause of the disease are presented under various related topics as follows:

Further observations on effects of the disease (pp. 587, 588).—The most sensitive test of the disease is considered to be the scaliness of the feet, especially the hind feet. This always appears within a few weeks after the young animal is put on the fat-free diet and disappears completely in 3 or 4 weeks after the diet has been supplemented with a good oil. Scaliness of the skin is also evident in dandruff on the back. Degeneration of the kidneys to such an extent that blood appears in the urine is of common occurrence and in most cases is probably the immediate cause of death.

Effect of protein intake on severity of the disease (pp. 588–590).—Evidence has been obtained to a limited extent suggesting that high protein increases the severity of the kidney degeneration so that bloody urine appears more frequently.

Effect of fat exclusion on water exchange (pp. 590–596).—Although the animals receiving no fat consumed almost twice as much water as the controls receiving fat, they did not excrete this excess water as urine, but probably by evaporation from the lungs and skin. "The water loss by evaporation reflects in some way the condition of the skin or lungs or both. It is not known which is involved, but it is quite clear that the lack of dietary fat has so injured the tissues that they are no longer the normal membranes separating the interior of the animal from its relatively dry air environment."

Effect of fat exclusion on ovulation and reproduction (pp. 596–601).—In the previous study vitamin E was not included in the diet. In order to be sure that none of the effects could be ascribed to lack of vitamin E, a concentrated fat-free preparation of the nonsaponifiable fraction of wheat germ oil was included in the diet as a source of E, with no observable effect beyond a slight increase in the growth rate of the males. All of the animals receiving this source of E developed a scaly condition and kidney trouble as early as those not receiving it. In the female rats ovulation was not improved, but when it occurred, as it did in about 50 per cent of the animals, the rats bred and produced litters, although very poor ones.

Fertility (pp. 601–606).—With few exceptions the males on the fat-free diet did not mate, while their controls receiving 10 drops of lard daily mated and sired normal litters. In the type of sterility induced by lack of fat in contrast with lack of vitamin E, the normal sex responses are lost. It is suggested that synthesis of both the ovarian and the testicular hormone, both of which are lipoidal in character, may cease when fatty acids are eliminated from the diet.

Nature of essential fatty acids (pp. 606–612).—In order to determine which of the fatty acids present in lard is the essential acid, a series of oils was chosen which would give a variety of fatty acid combinations and their effectiveness in curative tests compared with their composition. Butter and coconut oil were without effect either in improving growth or in curing the skin condition. Olive oil was slightly effective and corn oil and linseed oil quite effective. This suggested the probability that linoleic acid is the essential unsaturated acid. Further evidence confirming this theory was obtained in the cure of rats suffering from the low fat disease by pure linoleic acid and by poppy seed oil and egg lecithin which contained linoleic acid, and in the failure as the source of the essential substance of saturated fatty acids such as stearic, palmitic, myristic, and lauric.

Linoleic acid is itself thought to be an essential fatty acid which can not be synthesized in appreciable quantities. In discussing the probable significance of these findings in human nutrition, it is pointed out that "the human diet is often exceedingly low in fats of any kind and that when fats are added they usually contain little of the acids more unsaturated than oleic. Butter and coconut oil are the chief table fats, and beef fat is probably equally poor as a source of unsaturated acids. It is possible that our high carbohydrate and protein diets, carrying very little of the unsaturated oils, are contributing factors to poor health. The addition of egg yolk and cod-liver oil to diets may often improve the patient because of the fatty acid rather than the vitamin content. For example, cures of anemia with cod-liver oil have been reported, and it has been shown that there is a relation between experimental anemia and the unsaturated fatty acids of the blood plasma. The prevalence of dry skins and abnormal kidneys may be directly attributable to improper fat intake. The nerve tissue, kidneys, and other organs contain several unsaturated acids. If the liver is limited in its ability to produce these acids, they should be plentifully supplied through the diet."

Serum iron determinations applied to the study of experimental anemia, H. H. Riecker and M. E. Winters (*Amer. Jour. Physiol., 92 (1930), No. 1, pp. 196–204, figs. 2*).—In an earlier investigation of the relative effect of beef liver and iron salts on the rate of hemoglobin regeneration in experimental anemia from hemorrhage in dogs,[1] it was concluded that the iron content of the food administered was the sole regulator of hemoglobin production. This was at variance with the findings of Robscheit-Robbins and Whipple (E. S. R., 58, p. 497), who had shown that liver and kidney were of special value, but who had suggested that the effect of iron salts might depend upon an actual iron shortage. To prove experimentally whether or not there was an actual iron shortage under the conditions of the experiment, the iron content of the blood serum of dogs was determined during the course of and recovery from experimental anemia produced in a manner similar, except in a few particulars, to that employed by Whipple. Only distilled water was given, milk was used instead of salmon to insure food consumption, and the experiments were continued only long enough to obtain definite results. Iron citrate, liver, and spleen were fed in various amounts and the hemoglobin and serum iron levels determined on each specimen of blood drawn.

The values for serum iron and hemoglobin were not consistently parallel. The hemoglobin level appeared to be dependent upon the amount of blood being withdrawn and the rate of regeneration, while the serum iron was sometimes low during rapid regeneration of the hemoglobin. The iron intake was thus thought to be the sole regulator of the hemoglobin production. "It seems that if a specific stimulus to hemoglobin formation by food products is to be detected by feeding experiments, it must be shown that an abundance of iron is available for the animal, in order to avoid the depressant action of relative iron starvation. The possible effect on hemoglobin production by the stimulating action of the general metabolism by the foods also should receive consideration."

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[1] Jour. Clin. Invest., 5 (1927–28), No. 1, pp. 141–160.

Effect of metals purified by electrolytic deposition on hemoglobin regeneration in anaemic white rat, G. T. Lewis, T. E. Weichselbaum, and J. L. McGhee (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 4, pp. 329–331*).—In this study of the value of copper, manganese, and cobalt as supplements to iron in the regeneration of hemoglobin in rats rendered anemic by whole milk feeding, the metals, with the exception of manganese, were all prepared by electrolytic deposition. The manganese solution used was prepared from C. P. manganese sulfate as in the usual scheme of qualitative analysis, isolating it as the chloride. The iron was fed as the nitrate in amounts furnishing 0.5 mg., and the copper, cobalt, and manganese as chlorides furnishing 0.1 mg. of the metal per rat per day. Hemoglobin was regenerated only by the combination of iron and copper.

It is noted that neither raw nor pasteurized milk bought on the open market (Atlanta, Ga.) produced anemia in white rats even when fed as the sole diet for a period of six months. The milk used came entirely from one cow and was milked in an enameled vessel and brought to the laboratory in glass bottles.

The treatment of pernicious anemia with swine stomach, H. M. Conner (*Jour. Amer. Med. Assoc., 94 (1930), No. 6, pp. 388–390, figs. 2*).—Raw swine stomach has been found to compare favorably with liver in the treatment of pernicious anemia, the results corroborating the previous findings of Sturgis and Isaacs and of Sharp (E. S. R., 62, p. 398). The material is prepared by washing the stomachs quickly in running water, dipping them for a few seconds in boiling water, grinding in a Seprasive, and discarding the fiber. One-half lb. daily of the liquid and finely divided solid thus prepared is given in tomato juice, orange juice, or any other fruit juice, and is said to be well tolerated.

Botulism poisoning, W. G. Sackett (*Colorado Sta. Rpt. 1929, pp. 20, 21*).—At temperatures corresponding to the boiling point of water at various elevations in Colorado and with exposures of from one-half to eight hours, it has been found impossible to kill the spores of the organism responsible for botulism. It is concluded that there is no place in Colorado where vegetables and meat can be canned with safety unless the cans are heated for more than six hours at the temperature of boiling water. Canning in the pressure cooker is thought to be the only safe method.

Botulism resulting from consumption of canned onions, S. A. Koser and D. O. Reiter (*Jour. Prev. Med., 3 (1929), No. 6, pp. 499–504*).—Conclusive proof of the presence of botulinum toxin, type B, in canned Italian onions was obtained after the death of one person and severe illness of another who had eaten sandwiches containing them. The can from which the onions were obtained was slightly swelled. An inspection of approximately 400 cans of the same shipment revealed a little over 1 per cent of swelled cans, but cultures of *Clostridium botulinum*, type B, were isolated from only one can.

HOME MANAGEMENT AND EQUIPMENT

Fuels for cooking purposes in rural homes (*Indiana Sta. Rpt. 1929, pp. 52, 53, figs. 2*).—Of 30 rural home makers reporting the use of coal as the principal cooking fuel during the winter months, 93.3 per cent reported heating water for dish washing, 83.3 per cent heating water for laundry use, and 80 per cent heating water for bathing purposes. Only 13.3 per cent of these 30 homes were heated with furnaces.

In 41 rural homes where electricity was used as the principal fuel for cooking purposes, 64.1 per cent reported furnaces for heating the house. A number of farm homes have found that the combination coal-electric range is a very satisfactory type of stove for meeting the requirements of farm conditions, as it provides electricity for cooking purposes as well as a coal compartment which may be used as a means for heating the kitchen or for heating quantities of water.

The average amount of time per week spent with cooking stoves was 15 hours and 3 minutes for cooking on top burners and 4 hours and 24 minutes in the use of the oven for cooking processes. Ovens were used on an average of 3.9 times per week for an average period of time of 68 minutes.

Laboratory studies of the thermal efficiency of fuels showed the percentage efficiency with top burners of typical cooking stoves to be as follows: Coal, 5.3 per cent, kerosene 33.5, gasoline 40.3, artificial gas 50.9, and electricity 83.3 per cent. The efficiency of 1,000-watt open burners was 77.5 per cent, 1,000-watt closed burners 90.6, and 1,800-watt open burners 79.2 per cent. The utilization of the heat retained in the burner after the switch was turned off increased the efficiency of the closed burner from 82.7 to 86.3 per cent. "These results indicate the economy of utilizing the retained heat of burners when operating electric ranges in actual home practice."

MISCELLANEOUS

The forty-second Annual Report of the Colorado Agricultural Experiment Station for the year 1929, C. P. Gillette et al. (*Colorado Sta. Rpt. 1929, pp. 75*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1929, a report of the director on the work of the station, and departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

Work and progress of the [Idaho] Agricultural Experiment Station for the year ending December 31, 1929, E. J. Iddings (*Idaho Sta. Bul. 170* (*1930*), *pp. 32*).—This contains the organization list, a report of the director, and financial statements for the Federal funds for the fiscal year ended June 30, 1929, and for the remaining funds for the fiscal year ended December 31, 1929. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Forty-second Annual Report of [Indiana Station], 1929, J. H. Skinner and H. J. Reed (*Indiana Sta. Rpt. 1929, pp. 95, figs. 41*).—This contains the organization list, a report of the director summarizing the activities of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1929, and for the remaining funds for the fiscal year ended September 30, 1929. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Annual report of the Massachusetts Agricultural Experiment Station, 1929, F. J. Sievers et al. (*Massachusetts Sta. Bul. 260* (*1930*), *pp. 323–382*).—This contains the organization list, an introduction by the director, and departmental reports. The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

Annual Report of [Nevada Station], 1929, [S. B. Doten] (*Nevada Sta. Rpt. 1929, pp. 30, figs. 2*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1929, lists of station projects and publications, and a report of the director discussing the work and problems of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [May, 1930], edited by V. R. Gardner and A. J. Patch (*Michigan Sta. Quart. Bul., 12* (*1930*), *No. 4, pp. 121–166, figs. 4*).—In addition to articles abstracted elsewhere in this issue, this number contains one entitled Michigan Hens Have Good Rating in Contest, by E. S. Weisner (pp. 144, 145).

NOTES

Alabama Polytechnic Institute and Station.—The corner stone was laid July 14 for the new textile building of the School of Textile Engineering, established during the past academic year. This school is offering a four-year course leading to the degree of B. S. in textile engineering and a two-year certificate course. The new building will include laboratories and equipment for the manufacturing and processing of the various rayons and for full-fashioned hosiery knitting, and will provide, it is claimed, the first combination of theoretical and practical instruction in these lines.

Science announces that a research project in cooperation with the U. S. Bureau of Standards is to be begun in the newly opened chemical laboratory. This project will deal primarily with starches found in southern crops and the utilization of starch in the manufacture of textiles.

Colorado College and Station.—A new greenhouse is nearing completion and will be used in cooperation with the sugar beet improvement project of the U. S. D. A. Bureau of Plant Industry. A suitable tract of land has also been made available for this purpose.

Richard V. Lott, assistant professor of horticulture and assistant horticulturist, has resigned to become head of the department of horticulture at the Mississippi College and Station. Dr. Jule B. Loftus, assistant professor of veterinary medicine and assistant veterinary pathologist, has resigned to accept a position with the U. S. Department of Agriculture as Territorial veterinarian for Alaska, and has been succeeded by Dr. Bryce R. McCrory.

Sarah E. Stewart has been appointed assistant in bacteriology.

Delaware University and Station.—Joseph E. Vaile, instructor in horticulture and assistant horticulturist, resigned September 20 to take up graduate work at the University of Illinois and has been succeeded by L. H. Strubinger, assistant horticulturist in the Illinois University and Station.

Georgia Station.—Thomas A. Pickett, for the last two years a graduate assistant in agricultural and biological chemistry in the University of New Hampshire, has been appointed assistant chemist and assumed his duties August 15.

Kentucky University and Station.—A new dairy development building has been erected on the station farm and is to house the entire animal industry group of the College of Agriculture and the station. This building will contain a modern butter making laboratory, a market milk laboratory, an ice cream laboratory, and a cheese plant, as well as laboratories for studying nutrition problems and diseases and several classrooms.

C. H. Burrage, forester at the Robinson Substation, has resigned. Z. L. Galloway, assistant in farm organization and management, has been appointed field agent in farm management, and O. M. Farrington assistant in markets.

Mississippi College and Station.—J. R. Ricks, for the past 12 years director of the station, has accepted a position with the U. S. D. A. Bureaus of Animal Industry and Plant Industry as agent in forage and pasture investigations in the Southern States. He has been succeeded as director by W. R. Perkins, previously assistant director in charge of the South Mississippi Substation at Poplarville, and he in turn by Dr. J. C. Robert.

D. S. Buchanan, head of the department of animal husbandry, resigned September 1 to accept an appointment in the Texas College and has been succeeded by Dr. C. B. Cain. P. G. Bedenbaugh, assistant animal husbandman in the station, has been transferred to the instruction staff.

J. C. C. Price, head of the department of horticulture, and L. M. Ware, professor of horticulture and horticulturist, resigned September 1, the latter to accept a position in the Alabama Polytechnic Institute. C. B. Anders, associate in soils, and Ernestine Frazier, assistant in home economics research, have been granted leaves of absence for graduate study, the former for two years at the University of Maryland and the latter for one year at the University of Iowa. C. T. Ames, assistant director in charge of the Holly Springs Substation, resigned September 1 and has been succeeded by T. F. McGehee.

New Jersey Stations.—Resignations are noted of Ray Hutson, assistant entomologist in apiculture; Juan A. Bonnet, assistant in soil microbiology; Walter S. McClatchey, fertilizer and feed sampler; and David Levowitz, assistant in dairy manufactures. Recent appointments include Victor Alphons Tiedjens as a research specialist in horticulture; Harold T. Baker, instructor in agricultural engineering; Robert S. Filmer, assistant entomologist in apiculture; Byron O. Denny, research assistant in agricultural economics; Harold Robertson, assistant extension horticulturist; and Peter Barich, inspector of fertilizers.

North Dakota College and Station.—A. F. Yeager, professor of horticulture and horticulturist, has been granted leave of absence during the academic year for graduate work.

Rhode Island Station.—Donald E. Frear resigned as assistant chemist June 20 and was succeeded by Harry S. Hall August 1. Blanche M. Kuschke has been appointed assistant in home economics research vice R. Berniece Neil, whose resignation became effective September 1.

Tennessee Station.—A greenhouse, 21 by 25 ft., has been completed for the department of entomology and will be used for the breeding and study of insects.

S. W. Atkins, assistant agricultural economist, has been granted leave of absence for a year's graduate work at Cornell University. E. J. Hopkins has been appointed assistant agricultural economist during his absence. Norabelle Duncan has succeeded Adelaide L. Glaser as assistant biochemist.

Virginia Truck Station.—Robert L. Carolus has been appointed assistant in chemistry and soils, effective July 1.

Washington College and Station.—A soil erosion experiment station for the Pacific Northwest has been established by the U. S. Department of Agriculture in cooperation with the station. A 200-acre farm of typical Palouse land, 3 miles from the station farm at Pullman and especially adapted for soil erosion studies, has been made available for the purpose. W. A. Rockie and Paul C. McGrew have been assigned to the new station.

Dr. J. R. Neller, associate chemist, resigned September 1 to become biochemist in the Florida Everglades Station. Dr. L. A. Black, assistant professor of bacteriology and associate bacteriologist, has resigned to become associate bacteriologist at the University of Maryland. Carlton W. Corbin was appointed August 16 instructor in animal husbandry vice Hector G. McDonald, who became extension animal husbandman. Arthur J. Hanson was appointed entomologist at the Western Washington Station and assistant entomologist of the main station August 16, vice W. W. Baker resigned.

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EXPERIMENT STATION RECORD

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The late summer and early fall of 1930 were noteworthy for conferences in this country of two international groups of direct interest to agriculture. One of these was the International Conference of Agricultural Economists held at Cornell University from August 18 to 28. The other was the Inter-American Conference on Agriculture, Forestry, and Animal Industry at Washington, D. C., from September 8 to 20. Both of these gatherings represented relatively new movements, and the assembling of the respective groups typifies once more the increasing realization that few of the major agricultural problems of the day are delimited by national boundaries. The drift toward international cooperation in the consideration of these problems is as logical as it is significant.

The agricultural depression prevailing throughout the world made the Cornell conference a meeting whose timeliness and importance had probably not been fully anticipated when it was originally projected. This conference, it appears, had its genesis in the summer of 1929 when a gathering of 50 agricultural economists representing 12 countries assembled as guests of Mr. and Mrs. L. K. Elmhirst at Dartington Hall, Totnes, Devon, England. This gathering discussed research methods and results, national and international agricultural problems, and methods of bringing the agricultural economists of the world into closer contact with each other and of permitting more rapid and effective exchange of information regarding their work, and at the close of an enlightening 10-day program suggested a 1930 conference at Cornell University.

The invitation from this university which followed met with gratifying response. Over 300 persons were in attendance, of whom nearly one-third were from outside the United States. A considerable number of Government offices, universities, colleges, and semipublic and private institutions of Australia, Bulgaria, British Columbia, Manitoba, Ontario, Saskatchewan, Quebec, China, Denmark, England, Finland, Germany, Ireland, Japan, Mexico, Poland, Russia, Scotland, Wales, New Zealand, and the Philippine Islands were represented. From the United States the registration showed individuals associated with more than 25 State universities, agricultural colleges, and experiment stations, together with the Federal Farm Board, several bureaus of the Department of Agriculture, and a number of other universities, institutions, councils, commissions, and corporations.

During the conference about 80 papers were presented, covering a wide field and containing a large amount of information as to agricultural conditions, various phases of agricultural economics, the problems being studied, the methods being used, and the results being obtained in the several countries. Sectional organization was not attempted, and the very full programs at the general sessions made somewhat difficult a full discussion. None the less the papers brought about a considerable interchange of ideas among individual workers which was doubtless very helpful.

Naturally the theme of several sessions was the present agricultural depression, its causes, extent, seriousness, probable duration, and possible remedies. Much of this discussion centered around the causes and the effects of agricultural surpluses and monetary conditions, as presented in the papers of Dr. Max Sering of the German Agrarian Research Institute on Causes of the International Depression of Agriculture, of C. von Dietze of the University of Jena on The German Agricultural Situation, of R. R. Enfield of the British Ministry of Agriculture on Causes of the Agricultural Depression in Great Britain, of E. M. H. Lloyd of the British Empire Marketing Board on The Relation of Monetary Conditions to the Agricultural Depression, and of Dr. G. F. Warren of Cornell University on Causes and Probable Duration of the Agricultural Depression.

Of the many other papers worthy of special notice, mention may be made of the following as presenting information, illustrating methods, or embodying suggestions of more than usual breadth of interest or application: Types of Farming in the United States, by W. J. Spillman; Population Trends in Relation to Land Utilization, by O. E. Baker; and Some Post-War Interrelations Between Agriculture and Business in the United States, by L. H. Bean, all of the U. S. D. A. Bureau of Agricultural Economics; Maladjustments in the Agricultural Business of the World, by F. E. Geldenhuys of the Department of Agriculture, Union of South Africa, which suggested a world regulatory organization on the general plan of the U. S. Federal Farm Board; Farm Cost Accounting in the United States, by A. Boss, director of the Minnesota Experiment Station, which traced the history of such work and discussed its objectives and application of results; The Effect of Machine Production on the Price of Wheat, by W. E. Grimes of the Kansas Experiment Station; World Production and Prices of Merino and Crossbred Wool, by H. Stoker of the University of Pretoria; Relation of Quality to the

Price of Farm Products, by F. V. Waugh of the New England Research Council; Agricultural Economics as Applied Economics, by A. W. Ashby of the University College of Wales; Recent Developments of European Grain Imports, with Special Reference to Imports from North America, by R. Freund of the University of Kiel; Theory of Probability and Economic Research, by O. Anderson of the College of Commerce and Agriculture, Varna, Bulgaria; International Cooperation in the Field of Market Reporting, by A. Schindler of the German Agricultural Council; Science and Technique under Conditions of a Socialist Reconstruction of Agriculture, by N. I. Vavilov of the Lenin Academy of Agricultural Sciences; The Reconstruction of Agriculture in the Soviet Union, by A. J. Gayster of the Lenin Academy of Agricultural Sciences; Soviet State Farms and Specialization in Agriculture, by J. Anissimoff, director of the Institute for Large-Scale Farming, Moscow; and The Development of Agricultural Economics and of Farm Management in the U. S. S. R., by G. S. Gordeeff of the Timiriazev Agricultural Academy, Moscow.

Many of the papers and discussions touched upon such delicate questions as tariffs, international law, repayment of war loans and reparations, immigration, and the agricultural policies of different countries, but they were marked by both frankness of position and a spirit of fairness and consideration of the points of view of others. This attitude made the conference congenial as well as profitable and indicated future stability and helpfulness. There was a general feeling at its close that the results of the two years had justified a permanent organization, and this attitude culminated in the adoption of a constitution for what is to be known as The International Conference of Agricultural Economists. The object of this conference is set forth as "that of fostering the development of the science of agricultural economics and of furthering the application of the results of economic investigations of agricultural processes and argicultural organizations in the development of economic and social conditions relating to agriculture and rural life." Officers were elected to serve through the next conference, Mr. Elmhirst, sponsor of the movement, being chosen as president, with Dr. G. F. Warren of Cornell University and Dr. Max Sering as vice presidents and Mr. J. R. Currie, Dartington Hall, Totnes, Devon, England, as secretary-treasurer.

The Inter-American Conference on Agriculture, Forestry, and Animal Industry was the first of what are expected to be a series of similar conferences to convene periodically in the capitals of the various countries of the Pan American Union. Its primary purpose was to define and discuss fundamental problems with a view to their solution through scientific research and a continuing policy of inter-American cooperation. Originally suggested in resolutions adopted by the Sixth International Conference of American States at a meeting in Habana in 1928, it was sponsored by the Pan American Union, fostered by the Tropical Plant Research Foundation, and formally convened by the Government of the United States. Its official nature was further attested by the reception of the delegates by the President of the United States, a formal welcoming by the Acting Secretary of State, addresses by the Secretaries of Agriculture and Commerce, and the extension of various governmental courtesies and hospitalities.

Official delegates, numbering 54, were appointed by the 21 Pan American Governments. The delegation of fourteen from this country was headed by Dr. A. F. Woods, Director of Scientific Work of the United States Department of Agriculture. There were also registered about 170 consulting delegates, mainly from the Department of Agriculture and other institutions of this country, making the total enrollment considerably in excess of 200. Among these were representatives from a number of agricultural colleges and experiment stations, including those of New Hampshire, Cornell University, New Jersey, Maryland, Pennsylvania, Virginia, Florida, and Hawaii. The conference was organized with Doctor Woods as permanent chairman, representatives of the various visiting countries as vice chairmen, and Mr. L. M. Estabrook as secretary general.

The program was arranged to extend over a 2-week period of morning and afternoon general sessions. Many of these were in the nature of round tables, but there was no attempt to schedule more than one meeting at a given hour. This procedure permitted all delegates to hear the entire program, but was probably a contributing factor to a more or less fluctuating attendance and interest. Unusual provision was made for thoroughgoing discussion, and as much of this required translation from Spanish, the alternative language of the conference, more time was consumed than in gatherings without so pronounced a linguistic handicap. Considerable difficulty was experienced at times in keeping pace with the scheduled program, but ultimately all papers were taken care of and a large number of items of business duly completed.

The conference reflected at all stages the careful planning and attention to details which had characterized the preliminary arrangements. Nearly all of the approximately 60 technical papers had been assembled sufficiently in advance to permit of their printing in both English and Spanish editions, and multigraphed copies of those not otherwise available were in most cases shortly obtainable. In consequence few of the technical papers were read in full, thereby saving much time for the comprehensive discussions.

The scope of the conference was so broad that a wide field was necessarily traversed. Aside from data on surveys, inventories, and statistics, the program dealt in turn with problems as to land, forestry, animal industry, crop production, agricultural education, and agricultural economics. Most of the papers were prepared with a view to informing the delegates as to the existing status of knowledge in the respective lines, and for the most part were contributed by the staff of the Federal Department of Agriculture.

The keynote of the gathering was well sounded by Secretary Hyde, when he said "experience has taught us all that it is advantageous to have scientific knowledge as widely applied in as many countries as possible. This truth is not overruled by the hard fact of commercial competition. In agriculture the progress of science in one country, as in such matters for example as pest control, is a direct and obvious benefit to the whole world. Agricultural knowledge can not be successfully monopolized. . . . On many of the needs of agriculture, we can readily agree. We need the benefits of scientific research and of exact knowledge. Agriculture must have the results of experimentation in the selection of plant varieties and animal blood strains. It must be shown how to control insect pests and plant diseases. The value of our forested lands must be continuously stressed. National economy in the present and the preservation of the race in the future demand that the fertility of the soil must be maintained."

The closing sessions of the congress were devoted largely to business matters, and its findings were embodied in a series of 74 resolutions. Among the numerous projects favored were the interchange of experiment station workers under a plan to be worked out by the Pan American Union, a survey by the same body of problems of common interest to several countries, such as coffee production and livestock raising, the holding of regional conferences, and the formulation of coordinated programs; the making of weed, range, irrigation, and crop pest surveys; the establishment of an inter-American livestock advisory board to serve as a clearing house of information; the enactment of tariffs designed to encourage the introduction and commercial exchange of materials used for insecticides and fungicides and machinery pertaining thereto; the establishment of a graduate school of tropical agriculture at the University of Porto Rico in cooperation with Cornell University; the formation of an association of Latin American scientific workers, similar to the American Association for the Advancement of Science; studies in rural economics, farm machinery, and agricultural diversification; the creation of a Pan American agricultural bank; the stimulation of forest investigations and a comprehensive forestry policy; the reorganization of the division of agricultural cooperation of the Pan American Union along broader lines as a "center of coordination"; and the formation of a technical board on agriculture to advise the union on future programs and related matters.

One important series of resolutions centered around the idea of further standardization of methods and greater uniformity in terminology, the translation into Spanish of foreign words and phrases, and the assembling and exchange of available information. Under one of these resolutions, each Government is to be asked to send to the Pan American Union lists of its scientific institutions dealing with agriculture, copies of their publications, and a yearly summary of their outstanding findings. Another recommends the preparation of a list of American agricultural plants with their authorized Latin names and equivalents in Spanish, Portuguese, French, and English, and still another a centralized bibliography. A fourth resolution advocated the holding of a special conference for the purpose of promoting uniformity in methods and terminology, particularly as regards soils.

One of the specific objects which had been announced for the conference was the consideration of the feasibility of establishing and maintaining research stations or laboratories. Under this head a paper entitled "A Pan American Union Agricultural Tropical Research Station" was presented by Dr. Carlos E. Chardon, commissioner of agriculture and labor of Porto Rico, and recently appointed chancellor of the University of Porto Rico. Doctor Chardon outlined some of the factors to be considered in connection with such a station, finding its immediate opportunity to be along the line of coffee investigations at some point within the subtropical zone of Latin America, and with an estimated initial annual budget of from $100,000 to $120,000 to be contributed on a pro rata population basis by the several Pan American nations. Considerable interest was aroused in the proposal, including tenders of land from a number of Central American States, and the conference declared it to be "an ideal toward whose realization in the future Pan American effort should be directed," though "not a project which can be immediately carried out." The Pan American Union was asked to make a careful study of the entire question and to formulate as complete a plan as possible for future consideration. Pending the organization of a complete station, it was suggested that it should endeavor to secure partial agreements among countries having a common interest in certain subjects for cooperative special investigations of these subjects at existing institutions with suitable facilities.

The conference went on record as favoring a similar gathering in about five years, the date and place to be decided by the governing board of the Pan American Union, and to which private organizations and institutions as well as those under public control would be invited. This conference would be known simply as the Inter-American Conference on Agriculture, and its program would include more adequate provision for entomologists and plant pathologists. In the interim the holding of national conferences of comparable purpose was strongly advocated.

The tangible results of an international conference are frequently more or less difficult to evaluate, but there can be little doubt that in the case of both of the groups here discussed there were many distinct benefits. The interchange of views and viewpoints and the discovery of many things in common are well-nigh inevitable advantages. Perhaps the most outstanding gain was in the stimulation of cooperative endeavor through enlightenment as to how it may be most intelligently and effectively attained.

The sudden death on September 17 of Director G. F. Freeman of the Porto Rico Federal Station has brought to a close a career of substantial attainment and unusual promise. Although, as noted elsewhere in this issue, Director Freeman was but little over 50 years of age, he had made a unique record both in this country and abroad. His specific training in science and his most notable contributions to research were in the fields of botany and plant genetics, particularly as related to cotton, sweet corn, alfalfa, tepary beans, papago, and dates. In recent years he had turned his attention more largely to broader questions of organization and administration of agricultural education and research, particularly as applied to tropical and subtropical countries. Special mention should be made of his services as technical adviser in plant breeding to the Société Sultanienne d'Agriculture of Egypt, as agriculturist and economist of a French governmental mission to Indo-China, and as organizer and head from 1923 to 1930 of the Service Technique d'Agriculture of Haiti.

Appointed director of the Porto Rico Station on May 1, he had already achieved noteworthy success in various directions. In the words of another member of the station staff, he had revealed himself as "a man in whose character were combined many of those features which make for an ideal director of an agricultural experiment station. His tremendous interest in all phases of agricultural work both in the laboratory and field, his firmness and patience in dealing with trying situations, and his willingness to show with his own hands as well as by precept how to carry out any innovations he wished to see put into practice, all had the effect of arousing the enthusiasm of his staff and of activating even ordinary laborers. . . . The members of the station staff here at Mayaguez feel his loss most keenly. But we are very grateful to have had even a few months of the help and inspiration of his splendid leadership."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The materials of life, T. R. Parsons (*New York: W. W. Norton & Co., 1930, pp. XI+15-288, figs. 8*).—This is a popular outline of the principles of biological chemistry, and contains, following its preface, the chapters noted below: The value of biochemistry; the living stuff; sugar, starch, and fat; food; energy; the human machine; the living fire; wear and tear; digestion and indigestion; the chemistry of muscular exercise; blood and iron; health and vitamins; the biochemist v. disease; and the cycle of nature.

Under the head of further reading are added titles of similarly popular works and of some introductory scientific textbooks on biochemistry.

Studies in the chemistry of vitamin A, O. H. Cady and J. M. Luck (*Jour. Biol. Chem., 86 (1930), No. 2, pp. 743-754*).—These studies were suggested by previously reported observations of Bills (E. S. R., 54, p. 8) on the action of various chemical reagents on vitamin D. Growth and cure of xerophthalmia were both used as criteria of activity.

The effect was first tested of bubbling sulfur dioxide through cod-liver oil, butter, and a concentrated alcohol extract of alfalfa. In the cod-liver oil, treatment with sulfur dioxide for as short a time as 15 minutes at room temperature was sufficient to cause a marked decrease in vitamin A and at 100° C. for 2 hours to bring about complete destruction. In alfalfa extracts the destruction was inappreciable after sulfur dioxide had been bubbled through for 1 hour at 60°. Butter occupied an intermediate position. When fed at the same level as alfalfa extract, 5 per cent, marked activity was evident after 2 hours' heating at 60° and an appreciable activity after 22 hours at the same temperature.

In explanation of the difference between cod-liver oil and alfalfa, the authors suggest that the vitamin A activity of cod-liver oil is associated with a substance or substances not contained in significant quantities in plant materials, or else that the vitamin A of plant origin is associated with a protective substance not found in cod-liver oil.

In a further study of various reagents on vitamin A in cod-liver oil, complete destruction took place with phosphorus pentachloride, chlorine, acetyl chloride, nitrous fumes, and Benedict's alkaline copper reagent, and after prolonged treatment with sodium bisulfite. Hydrogen sulfide, ethylene, ammonia, and Benedict's reagent after neutralization had no destructive effect, formaldehyde had little effect, and hydrogen peroxide brought about a partial loss. Attempts to regenerate the vitamin A potency of oils that had been inactivated by treatment with sulfur dioxide and oxygen were unsuccessful.

The nature of vitamin C.—A study of its electrical transference, R. B. McKinnis and C. G. King (*Jour. Biol. Chem., 87 (1930), No. 3, pp. 615-623, figs. 2*).—A new type of electrical transference apparatus has been devised in which protection of the solution from alkali, oxygen, chlorine, and heat liberated during electrolysis, as well as oxygen from the air, has been secured. The cell is described as being "composed of three main parts, an anode compartment, a cathode compartment, and a middle section. The electrode compartments are porous alundum cups. The electrodes are identical, each being a platinum wire protected by an alundum tube, which is kept under a slight suction and through which a stream of sodium chloride solution and nitrogen gas circulates. The suction prevents diffusion of harmful materials out of the tube and the salt solution maintains conduction, and with the nitrogen rapidly carries away the liberated alkali, oxygen, or chlorine, in addition to much of the heat. Cooling coils are placed in all three sections. The cell is air-tight, and to insure this a stream of pure nitrogen is circulated under slight pressure through all parts."

This cell has been used to study the acid-base properties of vitamin C. Preliminary electrolysis experiments with the amino acids glycine and phenylalanine in filtered lemon juice made strongly acid with hydrochloric acid or weakly basic with ammonium hydroxide showed that after electrolysis for five hours with a current of 1.5 amperes the amino acids were concentrated approximately 8 to 1 in the cathode as compared with the anode chamber in the acid solution and 1.6 to 1 in the anode as compared with the cathode chamber in the weakly basic solution. Normal, hyperacid, and basic solutions of lemon juice of pH 2.4, 0.9, and 7 to 7.2, respectively, were subjected to electrolysis and the contents of the three chambers tested for vitamin C by the usual guinea pig feeding experiments. In the normal and strongly acid solutions no distinct transference of vitamin C to the cathode chamber could be demonstrated, while in the slightly alkaline solution the vitamin appeared to be concentrated in the anode chamber.

These findings are considered to be in harmony with previous evidence that vitamin C is acidic in nature.

The preservation of the antiscorbutic vitamin in lemon juice, J. Williams and J. W. Corran (*Biochem. Jour., 24 (1930), No. 1, pp. 37-50*).—This is essentially an extension of the studies of Davey and of Delf (E. S. R., 53, p. 567). The various preservatives tested included potassium metabisulfite in concentrations of from 0.02 to 0.04 per cent, lemon rind oil 0.07 to 1.1 per cent, hydrochloric acid in amounts to give pH values of 0.6 to 1.8, sodium hydroxide to pH 3, 0.05 per cent sodium benzoate, 0.25 per cent formic acid, 0.1 per cent oil of cloves, 10 and 30 per cent sucrose, and 30 per cent glucose.

The potassium metabisulfite, while being the best preservative for lemon juice against fermentation, had a definite destructive action, proceeding with measurable velocity, on the vitamin C at laboratory temperature. Lemon rind oil, while not preserving the lemon juice satisfactorily against fermentation, was less destructive toward vitamin C than was potassium metabisulfite. At a concentration of 0.07 per cent the lemon rind oil showed slightly higher protective action than at a concentration of 0.275 per cent.

In lemon juice at varying H-ion concentrations the vitamin showed the greatest stability at ordinary temperatures between pH 1.6 and 2.2, or in the neighborhood of the natural acidity of the juice. All of the other materials tested, with the possible exception of glucose, had no protective action toward the vitamin. The greatest destruction of the vitamin seemed to take place under conditions most favorable for the prevention of the development of molds and bacteria.

The measurement of hydrogen ion concentration, J. Grant (*London and New York: Longmans, Green & Co., 1930, pp. VIII+159, pls. [2], figs. [36]*).—In the author's opinion "there is a real need for a small book which gives the shortest and simplest account of the theoretical side of the subject consistent with the needs of the worker, together with a straightforward description of the methods used, in which no previous knowledge of electrochemistry is assumed."

Numerous sources of error are indicated, one section of the book is given over to methods especially modified to take care of special cases presented by certain industries, and rapid methods of calculation are described.

The contents are: Introduction—theory and choice of methods for the measurement of H-ion concentration; the electrometric method—outline and theory of the method, preparation of the electrodes and cells, electrometry or the measurement of electromotive force, and technic, sources of error, and calculation of results; the colorimetric method—the theory of indicators and an outline of the method, and practical; and methods and technic applicable to particular cases.

Effect of crops on those that follow (*Rhode Island Sta. Rpt.* [*1929*], *pp. 73, 74*).—"On the hypothesis that the different ratios of acid to base in the ashes of different plant species may cause sufficient changes in soil reaction or in other soil phenomena to affect succeeding crops," a method for the determination of the acid-base balance in plant ash was sought. "Ashing with an excess of magnesium nitrate in a muffle below dull redness retained the volatile acid elements, sulfur, chlorine, and phosphorus; and it was found practicable to determine the acid-base balance of the nonsilicious portion of the ash by titration methods. The Benedict-Denis method for sulfur in animal products was found to be well adapted to the determination of that element in plant tissue."

Variations in content of sugars and related substances in olives, P. F. Nichols (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 1*, *pp. 89–96*, *fig. 1*).—Basic lead acetate was found an unsatisfactory clarifying agent for aqueous extracts of the flesh of the olives examined in the investigation here reported from the California Experiment Station, the subsequent determination of reducing sugars by their reduction of picric acid giving high results.

"Reducing substances before and after hydrolysis remaining in the water extract after clarification by mercuric nitrate were found to be removable by a short treatment with yeast and are believed to be sugars. The early-season mean ratio of simple to total sugars, expressed as dextrose, usually declined as the season progressed. The total sugar percentage on the dry basis and in absolute amounts was found to increase in early season and to decrease in late season. Of the varieties studied Ascolano, P. I. G. 27172, Barouni, and Sevillano were high in sugar content; S. P. I. 27173, Lucca, Picholine, and Salome were low; and the Mission, Chitoni, Manzanillo, Chemlali, Columbella, Nevadillo, Bidh el Hammam, Saiali Magloub, and Uvaria were intermediate."

A method for determining the quantity of oil retained by citrus foliage after spraying, L. L. English (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 2*, *pp. 131–133*).—Sampling consisted in the clipping of 50 leaves, taken as soon as the spray had dried, "from various parts of each tree," and in the punching of disks having an area of 10 sq. cm. from each leaf. From each 50 disks the oil was extracted by shaking the sample with 50 cc. of ether in a tightly stoppered bottle for one minute, filtering off the ether, and reextracting with a further 50 cc. The filter paper was washed with 10 cc. of ether and the extractions concentrated together to about 20 to 25 cc., when the solution was floated on sulfuric acid of about 0.5 N concentration in a Babcock skim milk bottle, the ether driven off at about 50° C., the temperature gradually raised to 80°, and enough more hot sulfuric acid of the same concentration was added almost to fill the bottle. The mixture was then centrifuged hot and the reading finally taken with dividers in the capillary tube of the bottle.

METEOROLOGY

Monthly Weather Review, [March–April, 1930] (*U. S. Mo. Weather Rev., 58 (1930), Nos. 3, pp. 85–134, pls. 11, figs. 34; 4, pp. 135–178, pls. 16, figs. 17*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for March and April, 1930, solar and aerological observations, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 3.—The Climates of Alaska (illus.), by E. M. Fitton (pp. 85–103) (see p. 612); Gulf Stream Studies: General Meteorological Project (illus.), by C. F. Brooks (pp. 103–106); Fog in the Ohio Valley, by W. C. Devereaux (p. 107); An Unusual Snowstorm in Texas (illus.), by E. J. Foscue (pp. 108–112); The Measure of Droughtiness, by S. Marcovitch (p. 113); Discussion of A. Streiff's The Practical Importance of Climatic Cycles in Engineering, by J. W. Shuman (pp. 114, 115); and Further Studies on the Electrical Charges of Thunderstorms (A Report of Progress), by J. C. Jensen (pp. 115, 116).

No. 4.—Greenland West-Coast Foehns: A Discussion Based on the Foehns of January, 1929 (illus.), by L. R. Schneider (pp. 135–138); Secular Trend of Iowa Precipitation (illus.), by C. G. Reed (pp. 139–142) (see below); Alignment Diagram for " R " of the Energy-Evaporation Equation (illus.), by N. W. Cummings (pp. 142–144); Certain Limitations on the Possible Values of the Ratio of Heat Losses by Convection and by Evaporation at a Water Surface (illus.), by N. W. Cummings (pp. 144–146); Chicago's Greatest Snowstorm, March 25–26, 1930 (illus.), by O. T. Lay (pp. 146–148); Gulf Stream Daily Thermograms Across the Straits of Florida (illus.), by C. F. Brooks (pp. 148–154); International Meteorological Organization, with comments by A. J. Henry (pp. 154–156); and The International Convention for Safety of Life at Sea, London, 1929, by E. B. Calvert (pp. 156–159).

Climatological data for the United States by sections, [1929] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 16 (1929), No. 13, pp. [243], pls. 6, figs. 24*).—Summaries are given of climatological data for each month of 1929 and for the year as a whole for each State.

Climatological data for the United States by sections, [March–April, 1930] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 17 (1930), Nos. 3, pp. [207], pls. 3, figs. 2; 4, pp. [199], pls. 3, figs. 3*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for March and April, 1930.

Secular trend of Iowa precipitation, C. G. Reed (*U. S. Mo. Weather Rev., 58 (1930), No. 4, pp. 139–142, figs. 11*).—From a consideration of data for 53 years, 1875–1927, the author concludes that "Iowa is becoming steadily drier, but up to this time the tendency has not proceeded far enough to threaten its principal crop, corn; in fact, conditions for corn seem to be improving. There is, no doubt, a limit, but probably the trend will change before the danger line for corn is reached."

Climate as it affects crops and ranges in New Mexico, C. E. Linney, F. Garcia, and E. C. Hollinger (*New Mexico Sta. Bul. 182 (1930), pp. 84, figs. 6*).—This is a revision of Bulletin 113, previously noted (E. S. R., 40, p. 18), bringing the data up to the end of 1928. The extremely varied climatic conditions of the State are described. Data for precipitation, temperature, and cloudiness are summarized, and the agricultural possibilities of each county of the State are briefly discussed. Temperature and moisture are the principal limiting factors, and these vary widely with altitude. Practically all of the Temperate Zone crops and fruits are now being grown in the State, but the climate is not suited to tropical fruits. The choice of crops is limited over wide areas by altitude and deficiency of rainfall or water for irrigation.

The climates of Alaska, E. M. Fitton (*U. S. Mo. Weather Rev., 58 (1930), No. 3, pp. 85–103, figs. 27*).—The controlling climatic factors and the seasonal conditions of the five climatic provinces into which the territory is divided are discussed. The climatic provinces considered are "Pacific coast and islands (marine), Pacific coast and islands (rain shadow), Bering Sea coast and islands (semi-ice marine), Arctic coast (ice marine), and interior (cold continental)." The contrasts between the climatic and seasonal conditions of the different regions of the Territory are brought out. "The Pacific coast region has a really temperate climate resembling that of the northwestern coast of the United States, whereas all the rest of Alaska has a distinctly cold type of climate the year round, modified mainly by proximity to, or distance from, the surrounding oceans." The tundra areas of the Bering and Arctic coasts are in large measure flat, frozen, treeless wastes, while the broad interior plateau region has long hours of sunshine, with summer temperatures high enough to ripen grains and vegetables and to produce berries in abundance.

A bibliography of 46 references to literature on the subject is given.

SOILS—FERTILIZERS

[Soil research of the Connecticut State Station], M. F. Morgan (*Connecticut State Sta. Bul. 318 (1930), pp. 761–764*).—In a 4-year study of 70 soils, representative of practically all of the important soil types of the State, determination of the various plant food constituents and of the acidity together with observations of the effects upon the growth of a number of crops of variously combined treatments, indicated that 67 of the soils need lime for lettuce, 64 for alfalfa, 60 for beets, 58 for carrots, 50 for cabbage, 43 for turnips, 40 for sweet corn, 34 for oats, 9 for tobacco, and 4 for buckwheat. Oats and tobacco were the only crops to show definite symptoms of nitrogen deficiency on any considerable number of soils.

Phosphorus was a serious limiting factor for nearly all crops grown in the case of 63 of the 70 soils, and only 6 soils failed to show measurable response to potash. On three very acid soils tobacco showed symptoms of an excess assimilation of manganese.

"In general, it may be stated that the soil type is less important than the past history of the field in determining the present nutrient requirements of the soil for the various crops. However, under field conditions, differences in the physical character of the soil . . . will be of paramount importance in determining economic response to fertilizer and lime treatment."

In connection with farm soil surveys the examination of about 200 farms is reported, the summarized result of about 1,500 soil acidity determinations is given, and a similarly condensed report of available phosphorus determinations on the soils of three of the towns studied is made.

Leaching experiments in a battery of lysimeters, built in 1929, to a design here very briefly specified, yielded many available data despite an exceptionally dry season and the destruction of the crop by hail, the first problem studied having been the losses from heavy applications of 16 sources of nitrogen on four soil types. The equipment was found to compare favorably with any other of its kind.

Of various forest soil investigations, "results to date indicate that the microorganisms of the soil are most active in the fresh litter. In this layer organic nitrogen is being rapidly transformed into ammonia. Only a small part of this is transformed into nitrates in a three months' incubation period, except on soils of slight acidity. Ammonification occurs to a lesser degree in the older humus layer, which lies beneath the litter in forest soils where 'mull' formation is not active. Nitrate formation rarely occurs in this type of material. The more favorable mull types, under hardwood cover, usually show nitrate production in the surface layer of mineral soil."

Connecticut forest soils were found to consist in the main of the podsol type, the mull type, and an intermediate type, each here concisely described.

The Tobacco Substation, at Windsor, reports that "tobacco was stunted and unusually poor on plats that received annual applications of stable or 'adco' manure for four successive years. On these plats, the manure was used in addition to the regular commercial fertilizer application. The unusually dry season probably accounts for this behavior of the crop, which is quite different from the results of the wet seasons of 1927 and 1928."

The seasonal fluctuation in soil reaction was such that "in trying to find the optimum soil reaction for tobacco production it will be necessary to take into consideration the period of the year when the test is made. On plats where monthly tests have been made for the past two years the reaction was found to be highest in December and lowest in June, the extreme variation being from 0.5 to 1 pH unit."

[Soils and fertilizer work of the Florida Station] (*Florida Sta. Rpt. 1929, pp. 30, 31, 46–48, 94, 95*).—Progress on a number of projects is summarized.

[*Green manures*], W. E. Stokes and R. W. Ruprecht.—Analyses of *Crotalaria striata*, together with tests of its nitrification, indicated that the relation, or ratio, between the nitrogen and carbohydrates in the plant or any of its parts was directly associated with the rate of decomposition in the soil. In the early growth stages with a narrow ratio between carbohydrates and nitrogen and a lower percentage of cellulose and lignin, the decomposition of the plant proceeded more rapidly when incorporated with the soil. In the later growth stages decomposition proceeded more slowly. See also a note by Martin (E. S. R., 58, p. 517). Other green manure trials, including the use of Crotalaria, velvetbeans, cowpeas, and beggarweed, showed that under the local climatic conditions "it is practically impossible to build up or increase the organic matter content of the soil through the use of summer cover crops alone."

[*Lysimeter work*], W. E. Stokes and R. W. Ruprecht.—In the first group of these tests, cropping continuously decreased leaching about 20 per cent. The decomposition of green manures furnished nitrogen for the crop, but much green manure turned under without a growing crop increased the loss of plant nutrients. Other lysimeter work showed a loss of 40 per cent of the rainfall in the absence of a growing crop, or under a growing crop of Crotalaria, 27 per cent.

"Following the turning under of the green manure crop there was a large leaching of nutrients from the tanks which had Crotalaria or some other manuring crop turned under." When the nitrogen was applied in the form of fertilizer, however, the loss was still greater.

In a series of small leaching tanks, half planted with small citrus trees, the other half with no trees, "the use of the cover crop as a mulch appears to give a better utilization of the nitrogen of the cover crop and a conservation of the water so necessary to the utilization of the nitrogen."

Soil investigations, R. V. Allison.—Manganese and copper were applied on burned soils in the Everglades region, but the burning appeared to have lessened the need for the copper treatment. Soils which showed themselves deficient in manganese appeared in certain cases to be benefited by sulfur or sulfuric acid.

[Soil fertility studies in Nebraska] (*Nebraska Sta. Rpt.* [*1929*], *pp. 18–21*).—These include a continuation of earlier work (E. S. R., 61, p. 811).

The relation of weather, cultural practices, and soil conditions to nitrification in Nebraska soils.—In addition to yield increases, "the protein content was increased by the nitrogen fertilizers, being 12.75, 13.75, and 14.67 per cent, respectively, for the untreated, the ammonium sulfate, and the sodium nitrate treated wheat. . . .

"The indications from the work to date are that either sodium nitrate or Calurea can be used with profit on wheat on many fields in southeastern Nebraska where the soil is highly deficient in total nitrogen, especially in years when conditions for nitrification are unfavorable. Ammonium sulfate has not been a successful fertilizer for top-dressing wheat on the heavy textured soils of southeastern Nebraska. Harmful physical effects have resulted from the use of sodium nitrate in a number of cases. Calurea is possibly the preferable of the three fertilizers."

It was found possible to modify the phenoldisulfonic acid method for the laboratory determination of soil nitrates in such a manner as to make the method applicable in field tests.

A study of the factors which affect the tilth of soils.—"Atterberg consistency constants on 28 selected soils have been determined and reported. . . . Attempts to develop a mechanical means of determining an upper plastic limit on soils have not been successful, and a thorough investigation of the nature of both viscous and plastic flow in soil-water mixtures is now in progress."

A study of the restoration of organic matter in soils.—For work on the rate of decay of organic materials under field conditions "the nucleus of an extensive scheme of study has been assembled." For the work already done, "the data indicate that nitrogen depletion under western Nebraska dry-land conditions is substantially of the same character and rate as under eastern Nebraska conditions."

Soil acidity and liming.—A total of 78 liming experiments are briefly summarized.

[Soils and fertilizers], C. B. Williams (*North Carolina Sta. Rpt. 1929, pp. 27–40, 41, 42, 43–48, figs. 4*).—The year's work of the station and its branches not previously reported, consisted of the following:

Soil survey.—The percentages of the different soil areas in the various provinces of the State are summarized, as are also the important soil types by provinces and counties.

Special fertilizer and soil fertility problems.—Work on magnesium deficiencies of sandy soils "offers little evidence," for two years' work, "in the way of analytical data on which to base any conclusions." It was found that "the young plants [soybeans] on all the calcite treatments gave evidence of malnutrition similar to that attributable to magnesium deficiency but this was later outgrown in many instances."

In the same soil potassium sulfate showed itself superior to the chloride, and a pot culture test with corn further indicated the soil (Norfolk fine sandy loam) to be deficient in sulfur.

In muck soil tests of a need for copper and manganese, "an apparent lack of uniformity in the field where the first test was placed has raised a question as to the value of the first year's results."

In a trial of concentrated fertilizers cotton failed on Norfolk sand, and in pot tests to determine the nature of the trouble "the only progress made has been in the direction of eliminating some of the hypotheses suggested by the results of field and pot culture experiments."

In a strawberry fertilizer test alkaline spots in the field produced only small yellow plants, the soil condition appearing to have resulted from the ash of clearing fires. "An extremely acid soil on which strawberries would not grow" was found to need liming.

The Coastal Plain Branch Station reports a fertilizer test of the customary form, with results of local application, and a "soil type experiment" involving an annual replacement of potassium, phosphorus, and nitrogen in quantities the same as those found to have been removed by the crop. Soybeans on the limed end of the plats were chlorotic except where a form of basic slag replaced superphosphate. "This slag contains manganese, which has been shown [E. S. R., 54, p. 450] to control this chlorosis."

The Upper Coastal Plain Branch Station reports a "fertilizer ration and quantity" test, also a trial of sources of nitrogen in which urea gave the best acre average yield of seed cotton through limed and unlimed plats taken together, and cottonseed meal, of single substances applied, the poorest.

In a time and method fertilizer test on cotton "the results point toward the advisability of either dividing the application or of making it at least 10 days before planting."

The Blackland Branch Station reports locally applicable results of a general fertilizer test and a liming test on a muck soil.

The Mountain Branch Station reports soil fertility tests, a comparison of phosphatic fertilizers, and a rotation and fertilizer trial designated "soil type studies." Of the phosphate comparison the result is stated to have indicated that "when used in equivalent amounts, superphosphate and Duplex basic slag proved of equal value on the limed series, rock phosphate was second, and soft phosphate the poorest source. On the unlimed series this same relative ranking was obtained." Of the so-called soil type studies "yields for 1928 show the superiority of superphosphate over rock phosphate and the failure of the crimson clover to supply sufficient nitrogen for a good yield of the corn crop."

The Piedmont Branch Station reports attempts to determine the most serious plant food deficiencies of the Cecil series of soils; a comparison in which superphosphate was found, in equivalent quantities, more efficient as a phosphate carrier than rock phosphate; 1928 cotton yields indicating sodium nitrate as best and sludge the poorest of a number of sources of nitrogen; and a rotation trial.

Fertilizer results on soil type fields with farmers in different parts of the State.—Tests intended to indicate the locally serious deficiencies of Ashe loam, Appling sandy loam, Cecil clay loam, Wilkes sandy loam, Congaree silt loam, Norfolk sandy loam (low in organic matter), and Norfolk and Coxville fine sandy loams are detailed.

Soil fertility field experiments in cooperation with Federal Bureau of Chemistry and Soils on important soil types.—Fertilizer ratio experiments with sweetpotatoes; work on time and method of fertilizer application for potatoes; a concentrated fertilizer investigation in which, though some of the concentrated mixtures were not satisfactory, "the use of mixtures made from ammophos, potassium sulfate, and either nitrate of soda, sulfate of ammonia, or urea have shown up very favorably"; and fertilizer trials on Cecil clay loam at the central station and at two other points were included in this series of investigations.

[Soil and fertilizer studies at the Rhode Island Station] (*Rhode Island Sta. Rpt. [1929], pp. 66, 67, 72, 73, 75, 76*).—This report includes brief summaries of soil and fertilizer investigations, continuing earlier work (E. S. R., 61, p. 614).

Organic matter for the soil.—Golden Plume celery was grown on two plats where an annual application of 10 cords of stable manure is being compared with an annual application of fertilizer chemicals only and green manure. A heavy growth of rye was plowed in on the plat receiving an application of 1,500 lbs. per acre of a 6–8–6 fertilizer, while on the other plat the rye was cut and hauled away. There was no significant difference in the yields of celery on these two plats.

In a 3-year market-garden rotation, beets and carrots produced as high yields with 16 tons of manure-compost and green manure as with 32 tons of manure-compost without the green manure. Equal amounts of fertilizer chemicals were applied. Similar results were obtained with early tomatoes. Spinach and peppers yielded more with the heavier application of manure alone than with the lighter application of manure-compost and green manure, while neither was very effective with early cabbage. Green manure was not a satisfactory substitute for manure-compost with celery, and with this crop applying part of the nitrogen as side-dressings during the growing season produced better results than a single application when the plants were set out.

Efficiency of fertilizers and manures.—"Where no nitrogen was used in the fertilizer, the yield [of potatoes] was 252 bu. per acre, with medium nitrogen 321 bu., and with high nitrogen 236 bu. Applying as high as 84 lbs. of nitrogen per acre without increasing the other constituents in proportion proved highly detrimental.

"When a low potash fertilizer was used with potatoes the yield was 204 bu. and with high potash 336 bu. per acre. On the low potash plats 1,500 lbs. of a 4–9–5 fertilizer was used and on the high potash, a like amount of 4–9–10.

"No increase resulted from increasing the phosphorus in the fertilizer. Increasing the amount of 4–9–8 fertilizer from 1,000 to 1,500 lbs. per acre increased the yield by approximately 50 per cent. A further increase to 2,000 lbs. resulted in no further increase in yield."

Success in the treatment of nearly neutral soils with manganese salts continued as marked as in previous years. Beets and spinach showed a strong response to manganese treatment, and from sweet corn yield increases of as much as 25 to 50 per cent were obtained.

Indexes of nitrogen needs.—Each of the nitrogen fertilizers used was applied (1) at the time of planting and (2) in like total quantity but in three applications. The indicated work on plant and soil nitrogen was then carried out.

"During the growing season of 1929, nitrate, ammonia, and alpha-amino fractions of the nitrogen in the plant solution were determined for several market-garden crops. Soil nitrates were also measured. As has been found previously, the nitrates in both plant and soil were correlated with yields. Ammonia and alpha-amino fractions of plant nitrogen appeared to be affected more by the rate of metabolism as determined by environmental conditions, such as weather and moisture, than by fertilization. In general, the amino-nitrogen fraction was greater than 300 p. p. m., but a lesser quantity was found in nitrogen-starved beets. Ammonia nitrogen was normally less than 50 p. p. m., but was subject to sudden increases during periods of depressed metabolism, followed by rapid decline as the accumulations were used when metabolism was again normal."

The effect upon crop yields of the two methods of applying nitrogenous fertilizers varied with the character of the crop, and apparently, in certain cases, with the weather conditions.

Phosphate absorption.—The ability of soils to remove phosphate from buffer solutions of potassium dihydrogen phosphate with sodium acetate was observed to be such as to indicate "that long continued fertilization with superphosphate had had little effect in satisfying the phosphate absorption power of soils from the local soil type."

Aluminum activity.—"The quantities of aluminum extracted from soils of the plats of this station by 0.02 N acetic acid reflected the antidotal effect of phosphate fertilization for aluminum-sensitive crops better than has extraction with the 0.5 N acetic acid used previously. Normal field applications of lime or phosphates decreased the solubility of soil aluminum in the 0.02 N acid."

For the pot experiments on the aluminum toxicity of soils as measured by the quantity of aluminum taken up, buckwheat proved a better test plant than either millet or oats. The acetic acid method above noted proved, however, to be still better than any of the plants.

Soil organic matter.—An experiment to indicate the relative organic matter needs of certain market garden crops consisted in growing the crops in question in Wiley pots in triplicate at a maintained moisture level of 25 per cent. On the basis of the dry-weight yields, "onions, spinach, and lettuce may be placed, tentatively, in a high-response group, while beets and carrots are low in response."

Intercrop effects.—Following similar effects discovered in 1928, the incorporation of finely chopped buckwheat roots in the soil was shown to depress the growth of lettuce. The toxic principle was found to increase in effective quantity as the decomposition of the buckwheat roots progressed. Part of the crops containing the decomposed buckwheat roots were leached and planted to lettuce. In all cases the introduction with the roots of a toxic principle was indicated.

[Soil and fertilizer work, Utah Station] (*Utah Sta. Bul. 220 (1930), pp. 22–24, 30, 31, 40, fig. 1*).—The report continues previous work (E. S. R., 61, p. 19).

[*Calcareous soil treatment*], D. W. Pittman, G. Stewart, D. S. Jennings, and J. E. Greaves.—Tests on certain calcareous soils showed a response to commercial fertilizers less than that expected. Grains showed the greatest response to nitrogen, sugar beets to farm manure, and alfalfa to phosphorus with an increase of nearly 60 per cent in the yield accompanied by some increase in the nitrogen content of the hay.

Tests on the central farm showed that on this soil manure is highly beneficial to all crops tested and quite essential to sugar beets. Rotation was essential for small grains and beneficial to all crops except sugar beets under certain conditions.

[*Soil treatment at Carbon County Substation*], I. D. Zobell and G. Stewart.—This substation reports "(1) barnyard manure studies, (b) green manure studies, and (c) commercial fertilizers. Where barnyard manure is applied at the rate of 20 tons to the acre there is a large increase in crop production; the crop requires less water to mature it and the soil tends to hold the moisture much longer; there is also less tendency for the soil to wash and erode when barnyard manure has been applied." In the commercial fertilizer trials phosphoric acid appeared the most important plant food.

[*Use of organic manures*], J. E. Greaves.—It was found that the application of organic manures to the irrigated and dry-farm soils of the State increased the ammonifying, nitrifying, and nitrogen-fixing powers of the soil. The gain in nitrogen, attributable to nonsymbiotic nitrogen fixers, occuring under vegetation house conditions, varied from 0 to 304 lbs. per acre-foot of soil. Greatest gains occurred where legumes were used as the manure. The annual acre gain occurring in the soil under field conditions and attributable to nonsymbiotic nitrogen fixation was 44 lbs. Approximately 3,000 lbs. of applied organic material was decomposed annually.

[Soil Survey Reports, 1926 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1926, Nos. 10, pp. 37, figs. 2, map 1; 11, pp. 59, fig. 1, map 1; 12, pp. 49, fig. 1, map 1*).—Of the three surveys of this series here noted No. 10 was made with the cooperation of the Michigan Experiment Station, No. 11 with the cooperation of the Georgia State College, and No. 12 with that of the Alabama Department of Agriculture and Industries.

No. 10. *Soil survey of Kent County, Michigan*, R. Wildermuth and L. Kraft.—Kent County, Lower Michigan, contains a land area of 540,800 acres in the southwest part of the peninsula. Surface features include level plain and valley areas, some hilly sections, and "a number of large rolling or gently rolling areas." Drainage is provided by Grand River and by its tributaries.

Isabella loam occupies 26.7 per cent and Coloma sand 21.2 per cent of the area surveyed, the total number of series listed being 23, inclusive of 30 types.

No. 11. *Soil survey of Bartow County, Georgia*, G. L. Fuller and H. H. Shores.—Bartow County is an area of 294,400 acres in northwestern Georgia, varying from nearly flat to steep and mountainous. About four-fifths of the county was found dependent on the Etowah River for drainage, although some other streams were found to affect the extreme northern part.

Clarksville gravelly loam, of which "the surface," in part, "is so completely covered with the coarser gravel that cultivation is very difficult or impossible," leads in areal extent, with 16.9 per cent of the entire county, a total of 26 series and 44 types having been found. Unclassifiable lands were also found, including rough stony land, meadow, and mine wash to the extent of 1.4 per cent.

No. 12. *Soil survey of Montgomery County, Alabama*, J. F. Stroud et al.—Montgomery County consists of 515,840 acres of south-central Alabama, including the surface features of flat areas, rolling lands, hilly sections, and a region in which "the surface is rather badly broken, and in places . . . is not suitable for agricultural purposes." Drainage was found to range from inadequate in the first bottoms and in the flatter and lower second bottoms to excessive, with consequent serious run-off and erosion, in the southern part.

Of the total soil area Sumter clay, with 11.7 per cent, and Susquehanna clay, with 10.1 per cent, are the most extensive types, and, with other clay types listed, show 47.4 per cent of the entire county to consist of clay soils. In all, 29 types of 21 series are mapped and described, in addition to the Guin soils (undifferentiated), meadow, and gravel pits, comprising 6.5 per cent of the area.

Edwards County soils, E. A. Norton, R. S. Smith, E. E. DeTurk, F. C. Bauer, and L. H. Smith (*Illinois Sta. Soil Rpt. 46 (1930), pp. [2]+69, pl. 1, figs. 12*).—Edwards County, Ill., lies near the southeastern boundary of the State (Wabash River), occupies an area of 139,782 acres, and has a well-established natural drainage system.

Color-texture types to a total number of 17 were recognized in the present survey by the station and are divided into upland prairie, upland timber, terrace, and swamp and bottom land groups. A yellow-gray silt loam and a yellow silt loam, of the upland timber soils, led in areal extent with 38.34 and 24.64 per cent, respectively, of the total area of the county, and are followed by a bottom land deep gray silt loam with 12.4 per cent.

The usual supplementary experiment field data are appended.

Soil survey of Dukes and Nantucket Counties, Massachusetts, W. J. Latimer (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1925, No. 28, pp. 31, fig. 1, map 1*).—Dukes and Nantucket Counties comprise a group of islands possessing a total area of 99,840 acres. The group includes principally Martha's Vineyard, Nantucket, and the Elizabeth Islands, topographically characterized by low hills and some rather extensive plain lands. Drainage, at some points largely internal, was found for the most part good.

Carried out in cooperation with the Massachusetts Department of Agriculture, the present survey indicated Dukes coarse sandy loam, Plymouth stony sandy loam, Carver sandy loam, and Dukes loamy coarse sand as the principal soil types, with areas amounting, respectively, to 16.1, 13.3, 12.2, and 10.8 per cent of the total acreage examined. In all, 9 series containing 14 types were found. Areas aggregating 14.8 per cent of meadow, tidal marsh, coastal beach, dune sand, and peat were also found.

Caliche in Arizona, J. F. Breazeale and H. V. Smith (*Arizona Sta. Bul. 131 (1930), pp. 417–441, figs. 6*).—The term "caliche" is referred to the Latin *calx* as its origin, and is stated properly to mean a lime or calcareous deposit, rather than those of sodium nitrate, "and, in Arizona, the term caliche is now used almost exclusively to designate such [calcareous hardpan] formations. Caliche and hardpan will be used as synonymous terms."

"Caliche, wherever found in Arizona, was formed by the solution, transportation, and precipitation of calcium carbonate. . . . Caliche strata may be formed beneath the surface of a soil, either by the evaporation of descending surface water, or by the evaporation of ascending ground water."

It was found also that caliche may be formed by plant roots. Plants absorb soil water for transpiration, and the calcium carbonate dissolved in the soil solution is precipitated as caliche. As long as it remains permeable, caliche will move downward as fast as erosion removes the upper soil. "Caliche probably is formed upon the surface of a soil by the evaporation of surface or flood water. The formation under such conditions is hastened by the presence of algae and other water plants."

The base exchange property of organic matter in soils, W. T. McGeorge (*Arizona Sta. Tech. Bul. 30 (1930), pp. 179–213, figs. 7*).—This inquiry continued earlier work (E. S. R., 57, p. 613), and consisted experimentally in the study of the base-exchange property in highly organic soils in their natural condition and after the destruction of a greater or less proportion of the organic content by treatment with hydrogen peroxide, and in related experimental procedure.

It is concluded that "there is no relation between the nitrogen or nitrogen-carbon ratio and the exchange capacity of highly organic soils. Base exchange in highly organic soils takes place in chemically equivalent proportions. Using hydrogen peroxide as a reagent for destroying organic matter in soils, the loss in exchange capacity is approximately a linear function of the amount of organic matter destroyed. This loss in exchange capacity is due to a destruction of the organic fraction which functions in base-exchange reactions. That is, the active organic fraction is not simply rendered passive as happens when it is treated with solutions of aluminum salts. Digestion with hydrogen peroxide does not affect the replacement capacity of natural bentonites but destroys a rather definite part of the exchange capacly of synthetic zeolites. Hydrogen peroxide is of value for the approximate determination of the exchange capacity of the organic matter of soils by a 'difference method.'

"Lignin, lignohemicellulose, and lignocellulose or related bodies function largely as the exchange compounds of soil organic matter. Lignin from corncobs, lignin from soil (prepared by extraction with alcoholic NaOH), synthetic humus, and lignohemicellulose (prepared by extracting the soil with aqueous NaOH) all showed a definite chemically equivalent exchange capacity."

Experiments indicated that the trivalent aluminum ions of $Al_2(SO_4)_3$ or $AlCl_3$ could not enter the organic exchange complex to replace the divalent or monovalent ions absorbed by the lignin or lignin-like bodies. A partial loss in replacement capacity of lignin-like bodies when leached with a solution of aluminum chloride was observed; a loss restored by treating the soil with a basic hydroxide or with the solution of a salt, such as an acetate, yielding hydroxyl ions by hydrolysis.

Concentration of certain constituents of the soil solution under orchard conditions, E. L. Proebsting (*Hilgardia [California Sta.], 5 (1930), No. 3, pp. 35–59, figs. 2*).—Continuing earlier work (E. S. R., 61, p. 420), the soil solution nitrate content again showed a seasonal variation, having a spring minimum and a fall maximum. The sulfate, calcium, and magnesium contents showed seasonal variations similar to those of the nitrates. The potassium concentration remained practically the same throughout, while bicarbonates tended to fall off during the growing season. Alfalfa sod tended to reduce the content of nitrates, sulfur, calcium, and potassium. Under pears, the nitrate content was higher than under peaches, but the sulfate content was lower. An excess of cations was determined averaging about two milli-equivalents per liter, and this excess was greater in the case of peaches than of pears, in the alfalfa plats than in the checks, and on the average in the winter cover crop plats than in the checks.

Occurrence of nitrites in soils, G. S. Fraps and A. J. Sterges (*Texas Sta. Bul. 412 (1930), pp. 15*).—Nitrites were present in abundance in cultures made up from 200 gm. of soil by the addition of 0.1 gm. of ammonium sulfate in the form of an equeous solution, together with 10 cc. of an inoculant prepared from Lufkin fine sandy loam by the treatment of this soil with twice its weight of water, the supernatant liquid being used for the inoculation. Cultures to which no nitrogenous material had been added also showed the presence of nitrites; and soils which had either no power to nitrify ammonium sulfate or very little, might, it was found, produce large quantities of nitrites. Further statements are as follows:

"The relative capacity of a soil to oxidize nitrogen may be considerably larger for nitric and nitrous nitrogen combined than the nitric nitrogen alone. The production of nitrites was small the first week, a little larger the second, and much higher the third and fourth weeks of incubation. The production decreased after 28 days. . . . Nitrites persisted in the cultures for more than six weeks in considerable amounts. They also persisted practically unchanged for over a week in soil extracts. Nitrites are more stable than they are generally believed to be. Nitrites were present in very small amounts in the samples of field soils and labratory samples examined. Nitrites were produced from urea in some soils.

"The most favorable amount of water was 50 per cent of the water capacity of the soil. The production of nitrites as well as nitrates, is usually lower with both larger and smaller amounts of water than 50 per cent. The addition of calcium or magnesium carbonate increased the production of nitrous and nitric nitrogen from ammonium sulfate."

Effect of rye and vetch green manures on the microflora, nitrates, and hydrogen-ion concentration of two acid and neutralized soils, N. R. Smith and H. Humfeld (*Jour. Agr. Research [U. S.], 41 (1930), No. 2, pp. 97–123, figs. 12*).—The U. S. D. A. Bureau of Chemistry and Soils reports the addition of rye and of vetch, turned under at a rate of somewhat over 26.5 tons to the acre in greenhouse benches of Collington fine sandy loam and of Leonardtown clay loam under optimum conditions of temperature and moisture and with and without limestone, the last-named material having been added in quantities sufficient to bring the soil in each case to a reaction approximately neutral. The paper presents data on the effects of these treatments upon the total plate counts of the soil microflora, on the bacteria, the actinomycetes, the fungi, on the accumulation of nitrates, and on the soil acidity.

The organic material increased the total of soil microorganisms as determined on soil-extract agar in the cases both of the neutralized soils and of the soils in their naturally acid condition. In the unneutralized soils a rapid decline in total plate count was coincident with the disappearance of the leafy portion of the decomposing plant material, and the plate count remained low after this decline. In the soils neutralized with limestone a like decline was followed by a secondary increase and the number remained high. A further turning under of plant residues, six months after the first, "showed the same great increase in microorganisms during the first few days. This was followed by a reduction in numbers which continued to the end of the period of observation. No secondary rise took place as was noted in the first experiments."

"The increase in the soil microorganisms was due to the growth of bacteria. Both the Gram-negative and Gram-positive bacteria increased greatly during the active decomposition of the green manure. The secondary rise in bacterial numbers due to the effect of limestone was caused by an increase in the Gram-negative organisms. The number of fungi in the acid or neutralized soils was not influenced to any great extent by the addition of green manures. The number of actinomycetes was lower during the greatest development of the bacteria. This was due to overcrowding of the plates by certain rapidly growing bacteria. Otherwise no effect of the green manures was apparent.

"Green manures stimulated the accumulation of nitrates in both the acid and neutralized soils, the amount of nitrates being slightly lower in the acid soil. Although there were many irregularities, nitrates tended to be high when the bacteria were low, and vice versa. There was a tendency for the control soils to become slightly more acid as the nitrates accumulated. With the addition of green manure and a greater accumulation of nitrates, there was a definite increase in acidity on the sandy soil where no limestone was added. This was not so noticeable in the clay soil.

"In the early stages of decomposition small but significant amounts of alkali were produced in the sandy soil which reduced the acidity. Practically no effect was observed on the clay soil."

In a field test vetch green manure decomposed more slowly than in the greenhouse, but the effects were similar. "Rye green manure under these conditions produced practically no change in the number of soil microorganisms, in the amount of nitrate, or in the H-ion concentration of the soil."

A field test of different sources of phosphorus, C. F. Noll, F. D. Gardner, and C. J. Irvin (*Pennsylvania Sta. Bul. 252 (1930), pp. 14, fig. 1*).—The following statements cover the most important among numerous observations on 2 four-year tests on Hagerstown silt loam, which supplement work previously noted (E. S. R., 48, p. 818).

"Both yields and net returns increased with an increase in the rate of application of superphosphate and rock phosphate up to the highest amounts used, 600 lbs. of each per acre . . . both when the phosphates were used with nitrate of soda and muriate of potash and when used with 6 tons of manure. . . . Basic slag, steamed bone meal, superphosphate, and rock phosphate, used at rates supplying 48 lbs. phosphoric acid (equivalent to 300 lbs.

of 16 per cent superphosphate) and applied with nitrate of soda and muriate of potash, . . . ranked in yields and in net returns in the order given. Doubling and tripling the rock phosphate have increased the yields and raised the net return to nearly that from superphosphate.

"With 6 tons manure on limed and on unlimed land, 48 lbs. of phosphoric acid in basic slag has been compared with a like amount of phosphoric acid in superphosphate and with 96 lbs. in rock phosphate. . . . Again, the increasing order of yield and of net return has been basic slag, superphosphate, and rock phosphate." Finally, "both gypsum and sulfur, when added to rock phosphate, . . . increased the yields and profits."

Recommendations for specific crops and rotations are given.

AGRICULTURAL BOTANY

Mineral nutrition and chlorophyll development in seedlings, C. G. Deuber (*Amer. Jour. Bot., 15 (1928), No. 4, pp. 271–276, pl. 1, figs. 2*).—In attempting to account for the supposedly peculiar chlorophyll physiology involved in cases observed in which some seedlings grown in distilled water have smaller but more darkly green leaves than have seedlings grown in so-called complete nutrient solution, the author conducted analysis of the growth and chlorophyll (a and β together) conditions involved. The Wilson soybean seedlings used were grown in the manner usual with water cultures in mineral nutritional experiments, the Knop's solution having the composition $Ca(NO_3)_2$, 0.8 gm.; KNO_3, 0.2 gm.; KH_2PO_4, 0.2 gm.; $MgSO_4$, 0.2 gm.; $FeSO_4$, 0.0049 gm.; and distilled water to make 1,000 cc.

It is stated that the dwarfing is accompanied by a higher concentration of chlorophyll, particularly in the first leaves and to a lesser extent in the cotyledons, this condition accounting for the darker green in the tops of such dwarfed seedlings as compared with the normal green color of seedlings when better nourished. This condition is thought to result from the fact that the growth processes in seedlings growing on a low plane of mineral nutrition are impaired to a greater extent than are the processes controlling chlorophyll formation.

The effect of the salt concentration of the culture solution on the growth and composition of pineapple plants, C. P. Sideris, B. H. Krauss, and H. Masunaga (*Amer. Jour. Bot., 15 (1928), No. 6, pp. 353–371, figs. 4*).—Fluctuations observed in the salt content of field-grown pineapple plants, attributed at the time to age or locality, suggested the questions whether the salt concentration and pH values of the soil solution influence those of the tissue fluids and whether the salt concentration of a given soil solution, as determined by the electrical resistance method, indicates in any way its fertility or infertility, assuming that agricultural soils do not vary considerably in the kinds of salts in solution. These investigations deal with those questions.

It is claimed that plants grown in the cultures of higher salt concentrations take up more salts than those in the lower. Tissue fluids of young but fully developed leaves are raised in concentrations from 25 to 50 per cent and those of very old leaves from 50 to 150 per cent, by very high salt concentrations in the outside culture solutions.

Apparently in cases of very high salt concentrations in the outside solution the oldest leaves are used as storage organs for the salt excess over the amount required for normal functioning in the young but fully developed leaves. In case of low salt concentrations in the outside solution, the stored salts of the oldest leaves go to make up the deficiency. The pH of the external solution showed no influence on that of the tissue fluids. Plants grown in culture solutions equaling or exceeding as regards concentration the tissue fluids grew very slowly and after inactivity lasting nearly two months. Plants in solutions of concentrations much lower than those of the tissue fluids showed at first very rapid growth, then marked retardation in cultures of very low salt concentration. Medium concentrations gave the best development, although some of these suffered invasion by fungi, supposedly due to the softness of the tissues. The salt content was higher in the older than the younger tissues. The salt content of the oldest leaves was extremely variable, but greater than that of the younger leaves. The only leaves tending to maintain a uniform salt concentration were those which were fully developed and were at their functional peak.

The tissue fluid acidity varied considerably within a given organ and differed notably in different leaves.

It is believed that by making use of the salt concentration of the oldest leaves compared with those of young but fully developed leaves, when the plants are grown in cultures of either high or low salt concentration, a coefficient of salt absorption may be found which is correlated with the overnutrition, undernutrition, or normal nutrition of pineapple plants.

A study of the effect of hot and cold weather on the catalase of the plant and animal in relation to their respiratory metabolism, W. E. and E. L. Burge (*Amer. Jour. Bot., 15 (1928), No. 7, pp. 412–415, fig. 1*).—Catalase in needles of pine trees shows a correspondence with metabolism, both decreasing in colder and increasing in warmer weather. Catalase in the blood of rabbits is said to increase in winter with metabolism and to decrease with metabolism in summer.

The effect of ethyl alcohol on the turgor-pressure of Spirogyra, W. W. Lepeschkin (*Amer. Jour. Bot., 15 (1928), No. 7, pp. 422–424*).—The effects are tabulated showing the relations between ethyl alcohol concentration and turgor pressures up to bursting effects in Spirogyra.

"Further experiments showed that the increasing effect of stronger concentrations of alcohol upon the turgor pressure of Spirogyra must be ascribed to a very strong rise of the concentration of cell sap of this alga. Its cell sap contains much tannin, which forms a colloidal solution in water, but the solutions of tannin in diluted alcohol are molecular. Therefore alcohol penetrates into the cell sap, dissolves tannin molecularly, and increases its molecular concentration.

"Concerning the decreasing effect of small concentrations of alcohol on the turgor pressure of Spirogyra, the method of isotonic coefficients showed that this is produced by the increase of the permeability of protoplasm."

Chemical treatments for shortening the rest period of pot-grown woody plants, F. E. Denny and E. N. Stanton (*Amer. Jour. Bot., 15 (1928), No. 5, pp. 327–336, pls. 2, fig. 1*).—Following up the success in hastening germination obtained by Denny in previous trials (E. S. R., 55, p. 829), further tests were made with the chemicals previously employed, also with some others of similar nature, the experiments being carried out mainly with lilac (*Syringa vulgaris*) and its variety Charles X, flowering almond (*Prunus triloba*), flowering crab apple (*Pyrus ioensis*), *Azalea nudiflora*, *Deutzia gracilis*, and snowball (*Viburnum tomentosum*).

All of these except *V. tomentosum* were hastened into leafing or blooming by 24 or 48 hours' treatment with the vapors of various chemicals, the shortening in time for development of leaves or flowers varying from 2 weeks in case of Prunus to more than 60 days in case of crab apple. The most effective chemicals tried were ethylene dichloride and ethylene chlorohydrin. Favorable results given by propylene chlorohydrin, furfural, vinyl chloride, and acetylene tetrachloride were considered to justify further tests. In *D. gracilis* the relative development of leaves and flowers was determined by the concentration used.

Localization of response of woody tissues to chemical treatments that break the rest period, F. E. Denny and E. N. Stanton (*Amer. Jour. Bot., 15 (1928), No. 5, pp. 337–344, figs. 8*).—Following up the account above noted as showing the general forcing effect of certain chemical gases, the present paper emphasizes the fact that individual twigs and buds on the intact plant act as independent individuals under these vapor contacts. Lilac (*Syringa vulgaris*) proved to be a very favorable plant for such tests, as the buds are opposite and, at the twig tips, nearly side by side in pairs. The individual buds or twig tips once started ahead in this way grew vigorously, this fact showing that the roots and conducting tissues were not dormant but were ready to supply the sap as soon as the buds individually could use it. The study of localization within the bud is suggested.

GENETICS

Genetic characters in relation to chromosome numbers in a wheat species cross, F. J. Stevenson (*Jour. Agr. Research [U. S.], 41 (1930), No. 2, pp. 161–179, pl. 1, fig. 1*).—Relationships between chromosome numbers, characters of keel, collar, stem cavity, glume shape, reaction to stem rust, and reaction to leaf rust were studied at the Minnesota Experiment Station in F_1, F_2, and F_3 of Velvet Don (*Triticum durum*) × Quality (*T. vulgare*).

In the F_1 a total of 21 chromosomes, 14 bivalents and 7 univalents, was observed in the metaphase of the first division. F_1 plants had the durum type of keel and collar, pubescence, and red seed color, and an intermediate condition for stem cavity and glume shape and for beards, and were susceptible to stem rust. They set seed to the extent of about 5 per cent.

The behavior of the chromosomes in the cross largely resembled that reported for such hybrids by other investigators. When bivalents and unpaired univalents occur in the same plant the bivalents behave normally in both meiotic divisions. The univalents lag, come to the plate late, divide equationally, and join the members of the bivalents at the poles. The association between the chromosome number of each species and the typical characters of the same was apparent, although recombinations of the characters of both species were relatively frequent.

In F_3 relatively homozygous fertile segregates with the vulgare chromosome number, keel, collar, stem cavity, and glume shape combined with the stem rust resistance of the durum were obtained, and one fertile vulgare-like F_3 segregate possessed the leaf rust resistance of durum. On the other hand, certain durum-like plants with 14 chromosome pairs were as susceptible to stem rust as the vulgare parent. All plants of one F_3 line had 14 pairs of chromosomes and durum-like characters and, variably, an intermediate type of resistance to leaf rust. Cases of sterility are described.

"The relative frequency with which recombinations of the characters of the two species occurred is evidence that a cross of this kind can be used to advantage in plant breeding, and is contrary to the conclusion that the desirable and typical characters of the emmer and vulgare wheats can seldom, if ever, be recombined."

Genetical and cytological studies of Mendelian asynapsis in Zea mays, G. W. Beadle (*New York Cornell Sta. Mem. 129 (1930), pp. 23, pls. 6, figs. 2*).—A more detailed account of genetic and cytological studies of a Mendelian factor for failure of synapsis of the meiotic chromosomes of corn (E. S. R., 60, p. 323) is presented, the factor concerned being termed "asynaptic" and designated by *as*.

The asynaptic plants could be distinguished from normal sibs in the field by their sterile nature. Pollen sterility was apparently complete, whereas female sterility was variable. Usually less than 10 per cent of the ovules were found to produce kernels when asynaptic plants were pollinated with normal viable pollen.

According to the cytological observations, meiosis in the microsporocytes of asynaptic plants is characterized by partial or complete failure of synapsis during the prophase of the first division. The presence of many univalent chromosomes results in irregular distribution of chromosomes or complete failure of reduction; failure of reduction results in the production of diploid spores. Diminutive chromosomes were often noted in the microsporocytes of asynaptic plants. Analysis of the progenies of such plants showed that megaspores of asynaptic plants are often diploid. Kernels with triploid embryos produced on asynaptic plants were, on the average, about one-fourth the weight of kernels with diploid embryos produced on the same plants.

The possible relation of such genetic factors as the asynaptic gene to synapsis, crossing over, so-called hybrid chromosome behavior, apomixis, and the production of autopolyploids is discussed.

Mutation and hybridization in Ustilago zeae (*Minnesota Sta. Tech. Bul. 65* (*1929*), *pp. 108, pls. 13, figs. 7*).—This paper is presented in two parts.

I. *Mutation*, E. C. Stakman, J. J. Christensen, C. J. Eide, and B. Peturson (pp. 3–66).—The authors report that *U. zeae* comprises an indefinite number of monosporidial or haploid lines that differ from each other in so many physiologic characters other than sex that they might be considered physiologic forms. Certain lines mutate abundantly, others rarely, and still others suddenly begin to mutate. Some of the oustanding physiologic differences between mutants were ability to liquefy gelatin, digestion of casein, reduction of nitrates and iodine, and rate of growth at different temperatures. Pathogenicity and sex were closely interrelated, a fusion of lines of opposite sex being apparently prerequisite to infection. That pathogenicity is not a function of sex only was indicated in the fact that certain lines may unite to form chlamydospores without producing large galls. Sex mutations, such as the loss of sex factors which enabled their parents to unite with other lines, were observed, and mutations in regard to pathogenicity were not uncommon.

Nutrients and temperature apparently affected the rate of mutation, no mutation appearing in certain nutrient media and freely in others. High temperature apparently favored mutation. The authors believe that certain of the remarkable changes observed in fungi in culture may often be the result of mutations, and that in the corn smut problem such must be seriously considered in epidemiology and breeding for smut resistance.

II. *Hybridization*, J. J. Christensen (pp. 89–108).—This part deals with the results of combining various monosporidial lines of *U. zeae*. No evidence was found of complete interfertility or intersterility between strains obtained from widely separated areas. Chlamydospores were secured from six different crosses of monosporidial lines. A study of F_1 lines indicated that there are multiple factors in *U. zezae* for rate of growth, for type of growth, for color, consistency, and topography of colonies, and, possibly, for the tendency to mutate. There apparently are multiple factors for sex and pathogenicity. *U. zeae* is predominantly heterothallic. Evidence was obtained that the haploid lines are close and the so-called mutations are due to genotypic changes. The corn smut pathogene, therefore, comprises many lines with new ones being constantly formed by mutation and hybridization.

The anatomy of the mammary gland of cattle.—I, Embryonic development, C. W. Turner (*Missouri Sta. Research Bul. 140 (1930), pp. 34, figs. 22*).—The development of the mammary gland is described, based on the study of 42 embryos ranging in crown rump length from 0.8 to 23.5 cm. There was some uncertainty about the appearance of the mammary streak stage in the development of the gland, but the mammary line showed initial development in 1.7 cm. embryos. This line marks the location of the normal and accessory glands and accounts for their linear arrangement. Further proliferation of the Malpighian layer determines the number of glands, and in successive stages of development these foci are termed, progressively, the mammary crest, hillock, point, pocket, and bud. An invagination called the sprout grows into the bud, forming the duct, from which secondary sprouts develop.

The homology between the placental mammals and the marsupials and monotremes in the ontogeny of the mammary gland is noted.

FIELD CROPS

[Field crops research in Florida], W. E. Stokes, R. W. Ruprecht, A. F. Camp, R. V. Allison, and W. B. Tisdale (*Florida Sta. Rpt. 1929, pp. 26–30, 31–35, 46, 49, 66, 67, 90–93, 101, 102, figs. 3*).—Agronomic investigations reported on again from the station and substations (E. S. R., 62, p. 325) included variety tests with corn, cotton, peanuts, and sugarcane; breeding work with corn, peanuts, and cotton; trials of winter legumes, cover crops, and lawn and pasture grasses; fertilizer tests with corn, oats, peanuts, potatoes, sugarcane, pasture, and tobacco; treatment of crops with manganese and copper. cultural (including planting) experiments with potatoes and winter legumes; a mulching test with potatoes; pasture studies; and crop rotations.

The fertilization of Spanish peanuts with single elements with and without lime in the period 1918–1926, inclusive, did not return profitable increases in yield on Norfolk sand, and the lime actually materially decreased the yield. In the four years, 1922, 1923, 1924, and 1926, a slight increase in yield came from treatment with certain elements and combinations, and a slight response was had from the use of land plaster alone and in combination with certain elements, although in no case were the increases enough to be profitable. When land plaster was used on peanuts grown continuously on the same land, the first tendency in all varieties except Virginia Runner was toward increased yield of nuts, while after about the third year the yield of nuts on all sorts except Jumbo was so decreased as to be unprofitable. Where peanuts were grown on a different area each year land plaster profitably increased the yield of nuts of all varieties except Virginia Runner.

In corn fertilizer experiments the most profitable yields of corn were made after winter legumes were turned under. In such cases additions of commercial nitrogen to corn were not found necessary or profitable. Where corn did not follow a winter legume, a side application of 100 lbs. per acre of a readily available nitrogen carrier was the most profitable fertilizer on the average. Complete fertilizers to corn were not profitable thus far except on flatwoods soil of the Portsmouth series. February plantings of both late and early maturing varieties of corn have given higher yields than plantings up to June.

Of the nitrogen carriers applied as top-dressings to oats, sodium nitrate gave the greatest increase in yield in both October and November plantings. With each increment of sodium nitrate, 100, 200, 300, and 400 lbs. per acre, respectively, oats yields increased, although the 100-lb. rate of top-dressing proved the most profitable.

Planted after a variety-fertility test of winter legumes, corn made its highest yields after hairy vetch, monantha vetch, and Austrian peas in order. Corn after oats yielded less than one-half that after either vetch. Planted again to the same winter legumes the plat yields in each case were nearly 50 per cent higher than in 1928. Sweetclover gave very satisfactory yields when manure, phosphate, and lime were used.

In Bahia grass cut frequently in pasture fertilizer tests there was a progressive increase in the green and dry weight of top growth and weight of and percentage of nitrogen from the differently treated plats in the order sodium nitrate and water, sodium nitrate, water only, and no treatments, whereas the order was reversed with carpet and centipede grasses. Bahia grass permitted to mature showed a progressive decrease in percentage of nitrogen, even when heavily fertilized with sodium nitrate. High nitrogen was found associated with a vegetative growth condition and low nitrogen with the production of more reproductive plant parts and a decrease in vegetative growth. Frequent cutting or grazing appeared to be essential for production of more vegetative growth of prostrate growing pasture grasses for grazing purposes even when such grasses were fertilized heavily. Pasture plats treated with nitrogen yielded about twice as much as untreated plats, and their grass contained slightly more protein. Bahia, carpet, Bermuda, and centipede continued to be the outstanding pasture grasses.

The use of excelsior mulch on potatoes resulted in a yield increase of nearly 60 per cent, and it depressed soil temperature early in the fall from 8 to 15° F. Yields obtained indicated that pulling out all of the sprouts but one per hill would not pay. At Hastings a concentrated fertilizer (15–30–15) did not give as good results with potatoes as the usual fertilizers and appeared to delay germination. The injury seemed due to the ammonium phosphate content.

Sugarcanes of the Coimbatore group at the Everglades Substation were notable for ability to withstand conditions following hurricanes; for example, Co. 281 survived surface flooding which continued for some three months. After the flood subsided all buds upon physically sound stems were found to be hard and viable by test, and the germination of underground buds was prompt and normal in every way. A decided response of sugarcane to manganese fertilization was observed for the first time.

In 1928, shade tobacco on land at Quincy receiving no stable manure produced the heaviest acre yield, whereas on manured land much of the nitrogen in the commercial fertilizer evidently was consumed by denitrifying bacteria in decomposing the cellulose in the manure. The highest yield of the three best grades of leaf was not associated with the greatest total yield per acre, being made on plats receiving colloidal phosphate as a source of phosphoric acid. In 1929 there was no appreciable difference in growth rate, except that the plants on plats treated with colloidal phosphate and those receiving no manure and no cover crop remained smaller throughout the season.

[Field crops work in Nebraska, 1929] (*Nebraska Sta. Rpt. [1929], pp. 14–18, 28, 29, 36–38, 44, 45, 46*).—Experimental activities with field crops at the station and substations reported on as heretofore (E. S. R., 61, p. 824) included variety tests with winter and spring wheat, corn, oats, barley, alfalfa, and miscellaneous forage crops; breeding work with corn, winter wheat, oats, and potatoes; seed treatment studies with corn, wheat, and potatoes; fertilizer tests with wheat, corn, and oats; a production trial with Jerusalem-artichoke (E. S. R., 62, p. 632); meadow improvement; and crop rotations.

The use of advanced generation hybrids as parents in the production of F_1 double crosses in corn appeared to be quite feasible. The commercial production of double-crossed seed probably may be greatly simplified thereby, since it obviates the continual maintenance of inbreeding and natural crossing plats for the production of F_1 single crosses for parent material. It seemed possible to use hybrid seed produced in another State.

Cultural tests over extended periods demonstrated that the highest corn yield is obtained with three plants per hill, although a reasonable deviation therefrom is not serious. Evidently there may be considerable irregularity in the stand without affecting yield materially. The superiority of multiple-row plats was demonstrated. Further work with treatments for seed corn showed that Nebraska farm selected seed corn in general does not need disinfection. Where seed corn was severely infected with Diplodia the disease developed under conditions prevailing at the station, and where such seed was planted at least partial control of the disease organism followed seed treatments with various mercuric compounds. Other cultural studies with corn were noted earlier (E. S. R., 61, p. 129.)

Tillage investigations with winter wheat again showed the striking advantage of early preparation involving plowing or listing, together with timely supplementary disking. During 1929 the best practices returned double the acre grain yield made by the least productive method. Milling and baking studies with samples of standard varieties of Nebraska hard winter wheat disclosed that protein content is the predominating quality factor, regardless of the environmental conditions under which the wheat is produced. Compared on an equal protein basis with hard winter wheat produced in Kansas or elsewhere, Nebraska wheats were in no way inferior, despite the fact that Nebraska wheat could be bought at a price slightly under Kansas wheat.

In fertility studies during 8 years, winter wheat untreated averaged 29.4 bu. per acre and treated (all treatments) 31 bu., oats 37 and 40.7 bu., respectively, and corn 34.6 and 35.6 bu. The increased yields from commercial fertilizers did not suffice to produce a profit above the cost of material and application, and like results were had at Valentine with corn, barley, and rye.

The inferior resistance to low temperature of common alfalfa from southern seed sources, such as Arizona, New Mexico, Texas, Oklahoma, California, Africa, Italy, and Argentina, was fully demonstrated. Northern seed sources have supplied reasonably hardy common alfalfa seed, and Grimm proved relatively hardy wherever its source. The draft of alfalfa on subsoil moisture has been discussed elsewhere (E. S. R., 61, p. 518) by Kiesselbach, Russel, and Anderson.

Potato seed stock studies, especially with the Triumph variety, gave indications that the production of good seed need not be confined to the western part of the State. Cooperative trials at several experiment stations in the South in 1929 indicated that in the absence of disease irrigation was not a factor in the production of good seed potatoes, and this was confirmed at several points in Nebraska. The tuber index method had distinct advantages in getting virus disease-free stock. Through this system of indexing it was possible to eliminate mild and rugose mosaic, and it seemed probable that spindle tuber was also largely eliminated. Ethylene chlorohydrin treatments were found effective in terminating the rest period and in causing prompt germination in the fall and early winter. The more mature tubers and those stored in warm places responded most promptly. Treating the cut sets with a 5 per cent solution of ethylene chlorohydrin stimulated emergence in all seed treated. Satisfactory results were obtained when sets were dipped within two days after cutting, but after two days dipping was ineffective. Sets from large, dormant potatoes responded more promptly to the treatment than did those from small potatoes. Related work with potatoes by Werner has been noted from other sources (E. S. R., 61, p. 224; 62, pp. 224, 732).

[Field crops investigations in North Carolina, 1928–29], C. B. Williams and R. Schmidt (*North Carolina Sta. Rpt. 1929, pp. 40, 42–44, 51–55, 99–104*).—Continued agronomic activities (E. S. R., 61, p. 725) at the station and substations reported on included variety tests with corn, wheat, oats, rye, soybeans, tobacco, small grains for forage and cover, and miscellaneous winter legumes; breeding work with corn, wheat, rye, soybeans, peanuts, and tobacco; source of seed potatoes; fertilizer trials with tobacco; cultural (and planting) tests with potatoes and sweetpotatoes; and crop rotations.

Fertilizer tests with tobacco showed that about 80 lbs. of phosphoric acid, ammonia 40 lbs., and potash 60 lbs. gave the best returns. Mixed nitrogen gave better results than any individual source. Superphosphate as a phosphorus carrier was found more satisfactory than bone meal or basic slag. A mixture of potassium with two units from chloride and the remainder from potassium sulfate or from potassium-magnesium sulfate gave better results than when all was derived from either the sulfate or chloride.

In tests of the effect of chlorine, magnesium, calcium, and sulfur on yield and quality of the tobacco leaf some chlorine appeared desirable, but the yield without injury to the burn of the cured leaf seemed best when only 20 to 25 lbs. of chlorine per acre were supplied. More chlorine gave no very definite increase in yield and decidedly injured the combustibility of the leaf. On light sandy soils the use of from 40 to 50 lbs. of chlorine per acre materially injured the growth of the plant, producing a thick, brittle leaf and in extreme cases a "cupping" up of the leaf. See also another report (E. S. R., 63, p. 134) in this regard.

Magnesia was decidedly beneficial in the control of sand-drown, and its application wherever sand-drown or magnesia hunger was evident gave decided increases in yield and quality. Magnesia derived from ground limestone was effective in correcting this deficiency and can be used advantageously so long as the soil is kept slightly acid. For the present it appeared that the pH reading should not exceed 6. Potassium-magnesium sulfate may be used to supply magnesia with good results. The tobacco soils seemed to be well supplied with calcium and sulfur as the result of previous methods of fertilization.

Although the fuel consumption of a well-built frame curing barn with sides storm sheeted, papered, and weatherboarded tightly did not differ much from that of the concrete or clay tile barns, the latter had a much smaller fire hazard. Barns of fire-proof material cost more to build but were not prohibitive when the upkeep and the reduction of the fire hazard were considered.

Weather conditions were found important factors in the variation of yield from variously spaced potatoes. With the abundant rainfall of 1929 the closest planting distances, 2.5 ft. by 9 in. and 2.5 ft. by 12 in., gave the highest total yield and the greatest weights of No. 1 tubers. The percentages of No. 1s did not differ greatly in any of the planting distances.

Sweetpotato studies demonstrated the merits of improved strains, particularly from a certified source, and an 8–3–4 fertilizer formula was indicated for the Coastal Plain. Digging two weeks or longer after a hard killing frost was found to increase materially the losses in storage, injury to the stem end of the potato or inoculation from the injured stems appearing to be the direct cause of such losses. The best spacing seemed to depend largely upon weather conditions during the growing season. Results in 1929 favored the 12 to 15 in. distances in the row. Close spacing tends to increase the number of culls, while the wider spacing favors the formation of jumbos.

[Field crops experiments in Utah] (*Utah Sta. Bul. 220 (1930), pp. 24-29, 30, 31, 32, 33, 55, figs. 2*).—Variety tests with spring and winter wheat, corn, oats, barley, potatoes, sugar beets, beans, field peas, alfalfa, and miscellaneous forage crops; breeding work with wheat, alfalfa, and sugar beets; cultural (including planting) trials with wheat, sugar beets, and alfalfa; irrigation tests with alfalfa, sugar beets, and other crops; weed control studies; and crop rotations are again reported on from the station and substations (E. S. R., 61, p. 27)..

Several chlorates appeared effective in the eradication of certain troublesome weeds, especially on small areas. It seemed possible that the lawn weeds dandelion and chickweed may be controlled largely by spraying with iron sulfate supplemented by the use of a nitrogen fertilizer, as ammonium sulfate.

Frequent harrowing of fallow at the Nephi Substation actually reduced yields. Evidently no tillage for spring plowing equaled normal cultivation, which consisted of two harrowings and one leveling. Seven-in. plowing proved superior to shallower or deeper plowing. With spring plowing and normal care of fallow, from 15 to 20 tons of barnyard manure gave increased yields. From results over 14 years, ordinary fall plowing has an advantage over green manuring with peas. Burning of stubble did not appear advisable except where necessary for the control of weeds and insects. Considering safety and cost of cropping, no cropping sequence except alternation could be recommended where the rainfall is 13 in. or less, as in Juab Valley.

In rotations with wheat as the major crop and peas, corn, potatoes, oats, and barley supplementary in various sequences, yields indicated that corn and potatoes yield more after wheat than after fallow. Wheat also made higher yields after fallow than after a row crop. Cultivation of growing wheat was not advantageous, and with spacing between rows up to and including 21 in., yields differed little. The furrow drill was not superior to the ordinary drill under intermountain dry land conditions. For controlling smut on smutted grain, treatment with calcium carbonate, formalin, copper sulfate, and copper carbonate was favored rather than with commercial disinfectants.

Leaving the first growth of alfalfa unclipped or clipping not later than the beginning of blooming was most favorable for seed production at the Uintah Basin Alfalfa-Seed Substation. When clipping is in the late bloom stage or the alfalfa is grazed by sheep until June 15, the later growth produces a smaller seed crop and of inferior quality. Shallow cultivations sufficient to destroy weeds in early growth but not thinning the alfalfa stand had slight influence on seed yields. Under the conditions the highest yields and the best quality of seed were produced without irrigation; in fact, a light irrigation of 4 or 5 in. in the previous fall or early in the spring decreased the yield from 20 to 30 per cent compared with no irrigation. A similar application of water after early clipping stimulated excessive vegetative growth, and the seed yield was reduced to about 5 per cent of that obtained without irrigation. Actual yields of seed were highest in unmanured plats and lowest when as much as 15 tons of manure was applied. Alfalfa grown in rows yielded 10 per cent better in seed than check plats broadcasted 5 lbs. per acre, while yields in hills averaged 30 per cent higher than the checks in 1928 and 73 per cent higher in 1929. Two lbs. of alfalfa seed to the acre produced 60 and 88 per cent more seed, respectively, than 4 and 9 lbs. per acre. Artificial tripping of the flowers was found to result in an average increase in the seed yield of about 150 per cent.

The Utah common, Hardigan, Argentine, and Grimm varieties averaged highest in seed yield during the past three seasons. However, several of the poor seed producers were found to be excellent hay plants. Peruvian alfalfa was decidedly nonwinter hardy under Uintah Basin conditions, and Argentine and Italian alfalfa were not fully hardy.

Preirrigation of crops at the Carbon County Substation was not as successful as irrigating after planting, although preirrigation was advisable for corn and potatoes. Constant winds in the spring in the section made it necessary to irrigate sugar beets several times before they were large enough to thin.

Life history studies of mountain bromegrass (*Bromus polyanthus*) showed that as to depth of planting there was successful establishment from the surface to 1.5 in., while the moisture requirement for germination ranged from 8 to 18 per cent.

The influence of the insect factor in determining crop rotations, C. R. Neiswander (*Ohio Sta. Bimo. Bul. 145 (1930), pp. 99–102*).—The occurrence of severe insect injury to various crops often can be attributed to the method of field transfer from one crop to another, the type of crop in the rotation, or the nature of plant spacing in the succeeding crop. While extended outbreaks of most farm crop insects occur rather sporadically, it is considered advisable to choose rotations in which destructive insects can be kept at a minimum. This may be accomplished by including in the rotation a crop not susceptible to injury by the insects that attacked the preceding crop, or by following high accumulations of insects with crops whose nature of growth eliminates in a measure the destructiveness of the insects present.

Pasture improvement, G. L. Schuster (*Delaware Sta. Bul. 164 (1930), pp. 17, figs. 6*).—Pasture plats, variously fertilized and limed, were sown with several mixtures, and the production of forage and botanical composition determined during the four years, 1925–1928.

Grazing records showed that improved pasture could carry one cow per acre compared to one cow to three acres, the average carrying capacity of pastures in Delaware. In terms of replacement value of dry lot feeding, improved pasture was estimated to be worth $36.89 per acre, or $40.87 per animal per season.

The botanical studies and grazing conditions revealed that birdsfoot trefoil, meadow fescue, and bromegrass in the mixtures did not improve the grazing or turf forming qualities of the pasture. While timothy and orchard grass may be included as quick growing grasses before the permanent grasses are established, orchard grass is a rank growing bunch grass and should be used sparingly on land of medium to high fertility because of its tendency to crowd out the finer and more palatable grasses and clovers. Kentucky bluegrass, Canada bluegrass, redtop, timothy, white Dutch clover, and Japan clover were found to compose the best turfs for grazing. It was noted that white Dutch clover will not thrive on a very acid soil, under which conditions liming or replacement of the white Dutch clover with Japan clover is recommended.

Liming the soil appeared to induce a better turf formation by supplying a more desirable medium for grasses and white Dutch clover and at the same time to suppress weed growth. The highest yield was produced on the limed manured plat, and the best grazing turf occurred on the plat limed and treated with superphosphate and potassium chloride. Treatment with ammonium sulfate suppressed the growth of white Dutch clover. The soil, largely Sassafras silt loam of average fertility, did not show the need of nitrates for the production of a good turf where white Dutch clover would grow.

Pasture experiments, T. E. Odland, C. V. Wilson, H. O. Henderson, and E. P. Deatrick (*West Virginia Sta. Bul. 235 (1930), pp. 32, figs. 25*).—Pasture on Dekalb clay loam typical in topography of much pasture land in the State and too steep for plowing was variously treated on both limed and unlimed areas with manure and with superphosphate, alone and in combinations, and sodium nitrate alone, planted to three different seed mixtures, and a number of plats were disked. From 1922 to 1928 yields were obtained on the ungrazed half of each plat and the percentages of different pasture plants and weeds estimated on both grazed and ungrazed portions.

The highest yields and greatest improvement in kinds of pasture grasses were made on plats treated with manure with superphosphate, limed, disked, and seeded to a mixture. The combination of manure and lime was second best, and superphosphate with lime also decidedly enhanced yield and quality. Without lime these treatments were much less effective. Lime alone resulted in only small yield increases, although the quality of pasture was improved considerably. Sodium nitrate with lime gave some yield increase but was ineffective without lime. Disking or seeding without other treatments had little effect on pasture, and the three seed mixtures differed little in quantity or quality of production. The cattle preferred certain plats where improved pasture grasses were increasing.

Recommendations are that pastures of the type be top-dressed with lime and superphosphate and in most cases seeded with a simple mixture. If not too rough the land could be disked or harrowed. Top-dressing with manure may be expected to render good returns on such pastures.

[Grass experiments in Rhode Island] (*Rhode Island Sta. Rpt.* [*1929*], *pp. 69, 77*).—From plats where various quantities and kinds of fertilizers were compared for seed production of Rhode Island bentgrass, the best seed yields were obtained with a high nitrogen fertilizer. Increasing the phosphorus or potassium in the fertilizer did not increase the yields materially. An acre application of 1,200 lbs. of an 8-8-4 fertilizer produced the best yields of hay and seed.

When grown in solution cultures to which varying amounts of the three mineral nutrient elements were added timothy and redtop responded most to increases of nitrogen. Red clover did not grow well in distilled water cultures but thrived in tap water. Further distilled water cultures, to which small amounts of boron were added, gave indications of good growth.

Effects of irrigation with sewage effluent on the yields and establishment of Napier grass and Japanese cane, W. E. Stokes, W. A. Leukel, and R. M. Barnette (*Florida Sta. Bul. 215* (*1930*), *pp. 18*).—The possible utilization of sewage from septic tanks for the irrigation of forage crops was studied in cooperation with the U. S. D. A. Bureau of Public Roads. Plats of Napier grass and Japanese cane were irrigated with sewage effluent for four years (1922–1925, inclusive), and silage yields from these plats were compared with those from unirrigated plats and plats irrigated with city water taken during the irrigation period, and thereafter (1926–1928).

The silage yields of Japanese cane and Napier grass irrigated with sewage effluent during the irrigation period exceeded those obtained from these crops unirrigated and irrigated with city water. The ratio of the yields from the unirrigated to the plats irrigated with sewage widened during the irrigation period. After the irrigation stopped, yields of Napier grass silage from the plats which had received sewage continued to be about 3.3 times as large as the yields from the unirrigated plats.

Analyses showed the presence of considerable quantities of nitrogen compounds in typical sewage effluent. After irrigation was discontinued only slight increases were found in nitrogen content of the soil, and in the crowns and roots of Napier grass, only slight increases in organic foods on a percentage basis. The organic foods stored in the crowns of Napier grass from the sewage irrigated plats were, on a quantity basis, 3.5 times as large as those in the crowns of similar plants from plats not receiving sewage effluent.

The early fertilization of the forage crop with nitrogen (and perhaps watering) seemed to establish a larger plant system which remained more effective for the better utilization of soil nutrients and the elaboration of organic plant foods for increased silage production.

Effect of irrigation with sewage effluent on the yields and establishment of Napier grass and Japanese cane, W. E. STOKES, W. A. LEUKEL, and R. M. BARNETTE (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 540–548*).—Essentially noted above.

The production of cereals under irrigation in Washington, H. P. SINGLETON (*Washington Col. Sta. Bul. 240 (1930), pp. 20, figs. 3*).—Of approximately 3,000,000 bu. of cereals grown each year under irrigation in Washington, spring wheat comprises 75 per cent of the total tonnage, barley about 10, oats 8, and winter wheat 7 per cent or less. Spring wheat has outyielded other cereals in pounds of grain per acre, whereas winter barley proved to be a very poor crop for growing under irrigation.

Experiments, largely at the Irrigation Substation near Prosser, indicated Jenkin, Dicklow, and White Russian spring wheat for the lower valleys, Hybrid 128, Hybrid 123, Albit, and Ridit winter wheat, Markton oats, and Beldi Giant, Trebi, and Blue barley. The early maturity and short straw of Federation wheat seemed responsible for its wide use in Kittitas County.

Nitrogen appeared to be the nutrient needed for high yields of cereals. "The frequent use of forage legume crops in the rotation system will take care of the nitrogen supply." Early seeding fairly deep at rates of 2 bu. per acre for wheat and 100 lbs. each for barley and oats is advised from the results of cultural tests. A firm, moist seed bed seems essential for success. Late-sown land should be irrigated before planting. Ditching for irrigation should be done immediately after planting.

Growing alfalfa in Illinois, W. L. BURLISON, O. H. SEARS, and J. C. HACKLEMAN (*Illinois Sta. Bul. 349 (1930), pp. 409–448, pl. 1, figs. 13*).—Information gained from experiments in Illinois and elsewhere on alfalfa production is presented in regard to the uses of alfalfa; its place in the cropping system; soil, nutrients, and inoculation requirements; the yields, stands, winter resistance, and characteristics of varieties; cultural and harvesting practices; and alfalfa diseases.

The variegated alfalfas, as Baltic, Grimm, and Hardigan, have shown greater winter hardiness under Illinois conditions than common alfalfas, and are preferred in north-central and northern Illinois where it is desired to maintain an alfalfa meadow for several years. In central and southern Illinois common alfalfas, especially those of northern and northwestern origin, have seemed winter hardy enough, especially in rotations of two or three years. Seed grown in southwestern United States and imported seed (except from Canada) are not recommended for Illinois.

The spring seeding of alfalfa has given best results in northern Illinois and has gained favor in southern Illinois. Cultivation has not rejuvenated an alfalfa meadow at the station. In starting alfalfa a first-class seed bed on an adapted soil is deemed essential to success.

Of the three alfalfa diseases important in Illinois, bacterial wilt has destroyed fields in many counties, whereas leaf spot and yellows are often present but not so harmful, and their attacks are more or less seasonal and irregular.

Some soils in Illinois are naturally adapted to alfalfa, others may be rendered suitable by soil treatment, while still others are entirely unadapted to the crop. Where alfalfa is grown for the first time thorough inoculation is essential, since most Illinois soils are said to lack the bacteria suitable for alfalfa.

Limestone applications necessary to sweeten acid soil evidently should be based on the needs of each individual field. Farm manure has given a pronounced beneficial effect on alfalfa yields and has been especially valuable in giving a vigorous start to a new seeding. Phosphorus also can be used with profit on many soils, although the response has been varied. Applications of sulfur do not appear to be needed on Illinois soils.

Double-crossed corn in Minnesota, H. K. Hayes, H. E. Brewbaker, and F. R. Immer (*Minnesota Sta. Bul. 260 (1930), pp. 16, figs. 6*).—The double-cross plan of seed corn production is explained in detail, and data are presented on double crosses involving lines of Minnesota No. 13, Rustler, and Northwestern Dent produced in Minnesota to be distributed on a small scale to Minnesota farmers for the first time in 1930. Plans for the distribution of the double crosses also are included.

The commercial use of double crossed corn in Minnesota, H. K. Hayes (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 606–613*).—A somewhat more technical account of the activities noted above.

[Cotton research in North Carolina], C. B. Williams (*North Carolina Sta. Rpt. 1929, pp. 42, 48–51, 55, 56*).—Inheritance studies involving the fuzzy tip character of cottonseed gave indications that the factor *S*, which produces the smooth condition of the seed coat, is dominant to the factor *s*, which produces fuzz. The fuzzy tip factor *T* is dominant to complete fuzziness *t* but is masked in the presence of *S*. The data suggested that the genetic constitution of the parents is for the smooth seeded parent *SStt* and for the fuzzy tip parent *ssTT*.

In fertilizer tests higher yields of seed cotton in 1928 followed the use in a complete fertilizer of 75 per cent of total nitrogen from sodium nitrate and 25 per cent of cottonseed meal than from other nitrogen sources. A comparison of various proportions of organic and inorganic nitrogen showed with sodium nitrate and Leunasalpeter the highest yields at 75 per cent with 25 per cent from cottonseed meal, and with ammonium sulfate 80 and 20 per cent.

The largest yields in variety tests were secured from Mexican, Cleveland Nos. 884, 5, and 20, and Carolina Foster in cotton stapling from 1- to $1\frac{1}{8}$-in. and Wannamaker Cleveland in the $\frac{15}{16}$-in. class. The varieties producing from 1- to $1\frac{1}{16}$-in. staple gave the greatest money returns per acre. Varieties having light foliage, such as Carolina Foster, appeared well adapted to the heavy soils of the lower Coastal Plain. On wilt infested soils Dixie Triumph and Cook were found to be most resistant and were followed by Lightning Express, Super-Seven, and Mexican, whereas the Cleveland varieties were very susceptible to this disease. The response of strains of Mexican Big Boll to change of climate and soil type and a comparison of pure line and mass selection are discussed briefly.

Cotton fiber investigations in cooperation with the U. S. Department of Agriculture demonstrated that fibers from varieties having a longer staple length were smaller in diameter. There appeared to be a general tendency for an increasing length to be associated with a decreasing diameter and vice versa.

Potatoes, J. Bushnell (*Ohio Sta. Spec. Circ. 30 (1930), pp. 38–42, figs. 5*).—The principal observations in potato experiments concerned with varieties and sources of seed (E. S. R., 62, p. 35), liming of potato soils (E. S. R., 62, p. 36), potash starvation of plants (E. S. R., 61, p. 436), maturity of seed (E. S. R., 62, p. 35), date of planting and character of sprouting (E. S. R., 61, p. 32), size of sets (E. S. R., 61, p. 436), and straw mulch for early potatoes (E. S. R., 63, p. 35) have been recorded earlier.

Nitrogenous fertilizer applied in the row stimulated rapid early growth, although it had little other effect on potatoes. Benefits from nitrogen were most pronounced in early plantings followed by cool weather. Nitrogen was unprofitable in plantings made after June 1 on soil where cover crops had been turned under the preceding season. Side-dressing with sodium nitrate after the plants were up did not affect the yield of Irish Cobblers at the Washington County farm.

Sunflower (Helianthus annuus), compiled by M. F. WARNER (*U. S. Dept. Agr., Agr. Libr. Notes, 5 (1930), No. 1–3, Sup., pp.* [*20*]).—The 167 references included in this bibliography deal with the cultivation and utilization, breeding and heredity, botany, and diseases and insect pests of the sunflower.

Varieties of hard red spring wheat, J. A. CLARK (*U. S. Dept. Agr., Farmers' Bul. 1621 (1930), pp. II+26, figs. 16*).—This is a revision of and supersedes Farmers' Bulletin 1281 (E. S. R., 48, p. 231). Prominent varieties described include Marquis, which is the most extensively grown, Kota, Ruby, Preston, and Power, and the recently developed sorts Ceres, Marquillo, Hope, Reliance, and Reward.

HORTICULTURE

[Plant breeding at the Connecticut State Station] (*Connecticut State Sta. Bul. 318 (1930), p. 760*).—Inbreeding studies were conducted with sweet corn, strawberries, and black raspberries, and certain new varieties of squash, peppers, and spinach were made available for trial. Black raspberries showed no reduction in growth or fruitfulness after two generations of self-fertilization, and since seedlings were free of mosaic this method of reproduction was studied as a practical means of increasing stocks.

[Horticultural investigations at the Florida Station], R. W. RUPRECHT, A. F. CAMP, and J. H. JEFFERIES (*Florida Sta. Rpt. 1929, pp. 44, 45, 46, 48, 63–66, 82–84*).—Continuing experiments (E. S. R., 62, p. 334) upon the effects of different amounts of potash on oranges and grapefruit, no differences in the fruit were determined by chemical means, but those fruits receiving the minimum amount of potash were inferior in appearance. Announcing the discontinuation of fertilizer experiments with Satsuma oranges at Round Lake and Panama City, it is reported that at Panama City three applications of fertilizer per year gave greater growth than did equal amounts in two applications. Fertilizer seemed to decrease cold injury, as manifested by defoliation. No marked differences that could be associated with the source of potash were observed in Indian River citrus, leading to the deduction that in this area muriate of potash may be safely substituted for the more expensive sulfate. At Lake Harris no differences were observed in the growth or appearance of trees fertilized with low phosphate and normal phosphate fertilizers. Trees receiving urea and Leunasalpeter grew quite as well as did those receiving the usual forms of nitrogen.

Fertilizer experiments with pecans indicated that nitrogen and potash have the greatest influence on the growth, and that the source of the nitrogen fertilizer is rather immaterial.

As reported by Camp the jujube proved a satisfactory fruit, although one species, *Zizyphus mauritiana*, was found tender to temperatures of 25° F. A Rubus variety, Advance, was promising, being apparently immune to the double blossom disease which developed almost universally in seedlings of the Marvel blackberry. Among promising grapes are listed the Champanel, Lukfata, Extra, Herbemont, Jacquez, Jaeger 43, and Muench. As rootstocks for the Satsuma orange the citrange and citrangequat appeared promising. Yield records on tung oil trees showed an average per tree of 21 lbs. of shelled seeds from the ninth to the fourteenth year. The Elliott pecan fruited satisfactorily in Walton County. The value of cover crops for pecans was shown in a thriftier condition of the cover-cropped trees. Austrian Winter peas and hairy vetch are deemed the most promising legumes for winter use, with *Crotalaria spectabilis* for summer.

At Lake Alfred *C. striata* yielded the largest amount of material for soil improvement. Trees in the Crotalaria block were noticeably larger and deeper green than those in other blocks. Under clean tillage trees grew poorly and showed some die-back. Yields of the several cover crops are presented in tabular form, with data on the growth of the trees in the plats. Records on the first crop of fruit yielded by the trees showed the highest yield on the *C. striata* plat. The Meyer lemon again proved satisfactory.

[Horticultural investigations at the Nebraska Station] (*Nebraska Sta. Rpt. [1929], pp. 21–23*).—As previously reported (E. S. R., 61, p. 833), light pruning as compared with heavy pruning of fruit trees resulted in larger diameter and total wood growth. Comparing cane and spur pruning of Concord and Moore Early grapes, the former system gave a slight but rather immaterial increase in the number and size of clusters per bud. In variety tests of strawberries the Dr. Burrill and Premier proved promising. The Pixwell and Champion gooseberries and the Latham raspberry also did well.

In soil management studies no significant difference in growth was found on the several plats, although the trunk increment was slightly greater where intercrops of soybeans and cover crops were grown as compared with clean culture. The foliage of the trees in the clover sod was light green and small, a condition remedied by applications of nitrogen. Grapes grew better with mulch than under clean culture, although under the mulch soil moisture was higher and soil nitrates lower. The effects of mulching or tillage are believed to be closely associated with available water supply. No beneficial effect of superphosphate on tomatoes was observed either with or without irrigation.

Fruit stock studies indicated that whip grafting is particularly desirable with small roots and wedge grafting with large roots. Determinations of the arsenical residue on apples from young and from old orchards showed the fruit to be well under the international tolerance.

[Research in horticulture at the North Carolina Station], J. H. Beaumont (*North Carolina Sta. Rpt. 1929, pp. 92–99, fig. 1*).—Apple pruning studies at the Mountain Substation again reported on (E. S. R., 61, p. 734) by M. E. Gardner showed once more that light pruning is advantageous in respect to yield. For Rome, Winesap, Stayman Winesap, and Delicious the yields of the light pruned trees in 1929 were 2.1, 2.29, 5.34, and 7.06 bu. per tree, respectively, as compared with 0.94, 1.3, 2.7, and 1.9 bu. for the heavy pruned trees. Heading the tree at 36 in. at planting and training according to the modified leader system is deemed the best practice. Due to natural fertility of the soil young Delicious and Bonum apple trees did not show any increased growth from fertilizer. Apple storage studies conducted by Gardner at the Mountain Substation suggested that air cooling if properly managed will give good results.

As determined by C. F. Williams, peach trees receiving summer applications of nitrate made better yields and growth than did those not so treated. Based on the experiments and on surveys, recommendations are made on the choice of sites, development of organic matter in the soil, general care, and summer nitration. Gardner found that at the Piedmont Substation thinning peaches increased the size and marketability. A 4- to 6-in. spacing between fruits is recommended. Peach trees lightly pruned continued to outyield and give better colored fruit at a lower pruning cost than did severely pruned trees. Heavy pruning resulted in rank growth, poorly colored fruit, and a reduction in the fruit producing surface. Tests of the value of nitrate of soda for peaches in the Piedmont showed the value of annual applications, the no-nitrogen trees being in a declining condition. It is deemed likely that nitrogen may be the only fertilizer needed for peaches growing on strong Cecil clay loam. Hiley, Belle, Elberta, Hale, and Augbert trees with nitrogen averaged 3.6, 2.5, 3.43, 3.3, and 1.5 bu. per tree, respectively, as compared with 1.7, 2, 1.65, 1.75, and 0.94 for no-nitrogen trees.

Pecan variety yields are reported by R. Schmidt, together with tabulated notes on the character of the nuts.

Dewberry breeding conducted by Williams resulted in some promising Young × Lucretia seedlings possessing a wide variation in resistance to disease. Young × Austin Thornless yielded some thornless progeny in the F_1 generation, one in particular being fruitful, self-fertile, and promising.

Strawberry fertilizer studies by Schmidt and Beaumont led to inconclusive results due to soil variations. Of 17 strawberries tested by Gardner, the Warfield and Premier were the best.

Horticulture at the Ohio Agricultural Experiment Station (*Ohio Sta. Spec. Circ. 30* (*1930*), *pp. 50, fig. 20*).—Studying the effect of applied nitrogen on the chemical make-up of apples, analyses were made by J. H. Gourley and E. F. Hopkins of Wealthy apples from trees receiving 0 and 5.25 lbs. of nitrate of soda per tree. In 1929 there was a significant increase in the nitrogen content of the fruit from the nitrated trees. The average weight and moisture content were also greater in the nitrated fruit. No significant difference in the keeping quality could be attributed to nitrogen.

Certain data are presented by C. W. Ellenwood on the yield and time of blooming of apple varieties. Comparing grass mulch with culture and cover crops, Ellenwood found that Stayman Winesap and Delicious trees at the end of their fifteenth year had produced more fruit under the second system. The cost of production per bushel of apples was, however, approximately equal for the two systems. Stayman Winesap greatly outyielded Delicious over the period. Supplemental nitrogen applied since 1923 had not influenced yields. At the Clermont County Experiment Farm F. H. Ballou obtained conflicting results in comparing tillage and grass mulch, but where all varieties were averaged the yields were in favor of the grass mulch treatment. Supplemental applications of ammonium sulfate greatly increased yields under both systems. Sulfate of ammonia was apparently more effective than nitrate of soda. As recorded by Ellenwood, the average workman in thinning apples removed 1,246 fruits per hour by hand and 1,006 with shears. Observations on typical modified leader apple trees of six varieties showed an average of 8.4 main scaffold limbs per tree. Mulch paper was found by Ballou to be useful about newly set trees.

In discussing spraying and dusting, Ballou and I. P. Lewis urge the use of high grade finely divided lime. The manner of application is considered quite as important as the material used. Ellenwod presents data on the amount and cost of liquids and dusts required to protect different aged trees. On 30-year-old trees spraying was somewhat more costly than dusting.

Fertilizer studies with the strawberry conducted by J. S. Shoemaker showed the middle of August to be the most effective date to apply nitrogen. The highest yield was secured with a split application. Nitrogen increased size rather than the number of plants. Sulfate of ammonia applied in the spring of the fruiting year decreased yields.

Observations by Shoemaker on the tipping of black raspberry canes indicated that layering should be done when the tip has lengthened out with small curled leaves, and that one tip to a lateral yields the best plants. Some of the distinguishing characteristics of peach, pear, and plum varieties are set forth.

In discussing factors concerned in fruit setting of the apple, F. S. Howlett states that Stayman Winesap, Delicious, Winesap, and Arkansas were more susceptible to frost damage than were McIntosh, Wealthy, Grimes, and Jonathan which bloom at the same time. Prebloom frosts were less serious than afterbloom frosts with the Delicious and Stayman Winesap. Data are presented on the pollination requirements and capacities of various apples. Excellent germination of Delicious, Grimes, Jonathan, and McIntosh pollen was secured at 59° F. The arrangement of pollinizers, the value of bees in pollination, etc., are discussed. The important relation of the vigor of the tree to fruit setting, especially in varieties that naturally set light, is noted.

Descriptive notes are presented by R. Magruder on varieties of sweet corn, carrots, and peppers.

Comparing glass with glass substitutes, D. Comin found glass superior for raising vegetable plants, except parsley.

Data on paper mulch studies with vegetables are again reviewed by Magruder (E. S. R., 63, p. 137).

In studies on the fertilization of celery on muck, Comin found nitrogen to be the most important single element, and that chemical fertilizers were more effective than animal manures. Increased yields were obtained up to the maximum amount applied (2,000 lbs.). Work with vegetable fertilizers at Marietta is again discussed (E. S. R., 59, p. 835) by Comin.

Leaf pruning of tomatoes was found by I. C. Hoffman to decrease yields, delay maturity, and reduce growth. Top-dressing greenhouse tomatoes with sulfate of ammonia greatly increased yields and in the presence of adequate phosphorus and potash tended to hasten ripening.

Results of a test conducted by W. W. Wiggin of six materials, manure, green manure, peat moss, slag, straw, and leaf mold, as soil modifiers showed manure to be very valuable and peat moss with nitrogen to be useful, as was also straw with nitrogen. Green manure and leaf mold were good under certain conditions, but slag was not found satisfactory. Peat moss and other modifiers aided in moisture retention. Of fertilizers for flowers, manure was found consistently beneficial. Nitrogen proved the most important limiting element, though superphosphate and potash had significant value for tubers, corms, and bulbous plants. Repeated light applications of fertilizer were more valuable for greenhouse flowers than single heavy applications. Dried blood, Milorganite, nitrate of soda, ammonium sulfate, and Old Gardener fertilizer proved valuable sources of nitrogen.

Late planting of dahlias was better than early planting, and small sets were quite as valuable as large clumps. Dahlia cuttings flowered satisfactorily but produced few roots.

As recorded by H. C. Esper, peat, peat and sand, and slag over sand proved better rooting media for evergreens than did sand alone. Late fall proved a satisfactory date for taking evergreen cuttings, and bottom heat hastened rooting.

Budded roses were found by Wiggin to be more vigorous and more winter resistant than own-rooted roses. The care of flower cuttings in the propagation bed was found more important to success than was the medium used. Cuttings rooted better when taken between the nodes than at the node, and nontreated cuttings proved best.

Work with potatoes (pp. 38–42) is noted on page 634.

[Horticultural investigations at the Rhode Island Station] (*Rhode Island Sta. Rpt. [1929], pp. 67, 68, 76, 77, 78*).—In the usual form (E. S. R., 61, p. 640) brief notes are presented on the progress of various experiments. Results of varietal tests of sweet corn, cucumbers, muskmelons, squashes, and tomatoes are presented. Comparing paper mulch and ordinary culture, it was found that the yields of muskmelons, eggplants, and tomatoes were increased 20, 25, and 35 per cent, respectively, by paper. Yields of early cabbage were considerably decreased by lowering the amount of nitrogen in the fertilizer. Splitting the nitrogen application had no effect on the yield of cabbage, lettuce, and early tomatoes, but with the onion the best results were obtained with a single spring application. The soil reaction was found to have a marked effect on the response of ornamental shrubs to nitrate of soda and ammonium sulfate.

Horse and cow manures proved the best sources of organic matter for winter-grown tomatoes. Indications were obtained that the soil nitrate situation during the initial stages of growth has a significant effect on yield. No material differences were noted between bench and bed culture.

California- and Florida-grown gladiolus corms which were dug in April bloomed on November 17, continuing in blossom until January 18. California stock gave the better results, and primulinus varieties appeared best for winter culture. Chemicals failed to stimulate germination or growth. Rhode Island-grown corms dug in October and planted in November did not bloom until March 26.

Indications were observed that a lack of potassium limits the growth of grapevines and also of raspberries.

[Horticulture at the Utah Station] (*Utah Sta. Bul. 220 (1930), pp. 29, 31, 45–49, fig. 1*).—Again presenting the customary report (E. S. R., 61, p. 37), it is recorded that at the San Pete County Substation certain vegetables, including tomatoes, squash, melons, cucumbers, beans, and corn, were not suitable, whereas carrots, parsnips, beets, cabbage, cauliflower, and celery grew satisfactorily. In tests at the Carbon County Substation tomatoes, onions, and cabbage did not thrive, whereas asparagus because of its resistance to alkali did well.

Studies of the changes occurring in ripening Elberta peaches gave evidence that color and pressure tests are the most reliable indexes to maturity. Fruit past the green stage and in the lemon yellow stage developed satisfactory quality and handled better than that which had reached the orange yellow stage.

Results of cherry pollination studies indicated that certain strains of Black Tartarian, with the Windsor and Black Orb, are satisfactory pollinizers for Bing, Lambert, and Napoleon. Centennial and Black Republican gave fair results, and Deacon, Giant, Seneca, and Schmidt are deemed of promise as pollinizers. Notes are presented on the progress of variety tests with various fruits. At the Davis County Substation the Marshall strawberry and the Utah celery were valuable.

Varieties of apples for Pennsylvania, F. N. FAGAN and R. H. SUDDS (*Pennsylvania Sta. Bul. 253 (1930), pp. 16, figs. 9*).—Dividing Pennsylvania into five apple districts, varieties are recommended for each, with reference to both home and commercial plantings, and descriptions are given of the important varieties, together with a list of those tested at the station and found undesirable, with comments as to the reason for the undesirability. Certain highly colored bud sports of Rome, Delicious, Stark, and Stayman Winesap, and the new varieties, Cortland and Golden Delicious, are discussed in some detail.

The cherry industry in the Lewiston orchards, with cultural recommendations, E. C. BLODGETT (*Idaho Sta. Bul. 171 (1930), pp. 19, figs. 6*).—A general discussion of the present status of cherry production in the Lewiston area, with information on varieties, pollination, planting systems, irrigation, culture, pruning, pests, handling the crop, etc.

Some factors influencing the keeping quality of fruit in transit, J. W. Lloyd and H. M. Newell (*Illinois Sta. Bul. 350* (*1930*), *pp. 449–484, figs. 8*).—This second report (E. S. R., 61, p. 836) upon fruit transportation studies in Illinois deals principally with the effects of certain harvesting, packing, and loading practices. Tests with strawberries showed a marked increase in the percentage of spoiled fruit as a result of rough handling. Pan grading of strawberries increased the percentage of spoilage somewhat, as compared with field-graded fruit, but yielded a much better appearing product. Basket liners reduced the injury to peaches and summer apples packed in bushel baskets. Under conditions of careful handling gloves were not a factor in preventing injury to apples and peaches. Overripe fruit suffered severe injury in transit. Slack packing was a cause of injury to peaches and apples, more so than shaking the baskets to insure a firm pack. Rapid movement of fruit to the refrigerator was found desirable, especially under conditions of high temperature. Early morning picking aided in the maintenance of desirable temperatures.

Raspberries and blackberries in Ohio (*Ohio Sta. Bul. 454* (*1930*), *pp. 78, figs. 39*).—Presented in three parts, (1) Culture, by J. S. Shoemaker, (2) Diseases, by C. W. Bennett, and (3) Insects, by J. S. Houser, this bulletin includes a comprehensive discussion of raspberry and blackberry growing in Ohio. In part 1 data are included which show a marked correlation between yield per cane and diameter at 6 in. above ground. Pruning the laterals of the Cumberland black raspberry tended to decrease the number of berries and to increase their size, with but little difference on total yield, particularly in dry years and on poor soils. With King red raspberries pruning had no appreciable influence on size of berry and reduced total yields. Again a positive correlation was observed between cane diameter and productivity.

Blackberry and muscadine grape culture at Hammond, Louisiana, B. Szymoniak (*Louisiana Stas. Bul. 213* (*1930*), *pp. 7*).—Information of a general nature is presented on the culture of the MacDonald blackberry, Lucretia dewberry, and certain muscadine grapes, among which the Thomas proved the most valuable.

The fruiting habits and pruning of the Campbell Early grape, N. L. Partridge (*Michigan Sta. Tech. Bul. 106* (*1930*), *pp. 48, figs. 5*).—In a like manner to a similar paper by the same author (E. S. R., 54, p. 340) dealing with the Concord grape, this paper presents the results of a study of the growth and fruiting habits of the Campbell Early grape, particularly as influenced by pruning. Contrary to conditions with the Concord and Moore Early, the larger the diameter of the shoots of Campbell Early, as measured in autumn after harvest, the greater is their producing capacity. Canes at least ⅜ in. in diameter are desirable, since these produce more shoots per node, more vigorous shoots, and yield more and larger clusters than do smaller canes. With all lengths the largest canes were most productive.

There was very little correlation between the length of the internode and productivity in the Campbell Early grape. In general the node of maximum productivity was farther from the base of the cane than in the Concord, making it advisable to leave longer canes at pruning. Campbell Early canes that had 15 nodes were more productive than those of other lengths. The last 5 nodes on 20-bud canes were less productive than the median portion, and under the same pruning treatment 20-bud were less productive than 15-bud canes. With weak vines it is advised that the number of canes rather than the nodal length be reduced.

The Campbell Early grape was most productive on soil too rich for the Concord. A study of the relation between the vine growth of the preceding season, measured by weight of prunings and yield, showed the maximum yields to be obtained from vines whose prunings weighed from 2 to 2.9 lbs. The correlation between growth and yield in Campbell Early was less conspicuous than in Concord. There was very little correlation between the number of bunches per vine and their average weight or size.

As determined by the Brix hydrometer, the percentage of solids in the juice was somewhat larger in fruit of severely pruned vines. The average production per vine also varied with the severity of pruning, but it was not established conclusively that production had any definite effect upon the Brix reading.

Open pollination vs. hand pollination of pollen-sterile grapes, O. EINSET (*New York State Sta. Tech. Bul. 162* (*1930*), *pp. 14, figs. 6*).—Using vigorous vines of both self-fruitful varieties, namely, Concord and Rosaki, and self-unfruitful varieties, Brighton, Eclipse, Lindley, and Pontiac, the author found that covered blooms of the self-fruitful kinds set quite as well as those exposed to open pollination, while in the case of the self-unfruitful varieties the covered clusters were practically of no value. Comparing hand pollination with open pollination in the presence of adequate bees, self-unfruitful varieties responded very positively to hand pollination, setting much more freely than when exposed to open pollination.

In general conclusion the author suggests that grape breeders should work toward the development of self-fruitful varieties, and that if pollen-sterile varieties are planted because of their superior qualities special attention should be given to providing adequate cross-pollination.

A study of the composition of pineapple plants at various stages of growth as influenced by different types of fertilization, J. M. HORNER (*Hawaii. Pineapple Canners' Sta. Bul. 13* (*1930*), *pp. 42, figs. 19*).—Analyses of plants grown on differential fertilizer plats located on a typical pineapple soil showed that the pineapple crop removes more potash from the soil than any other mineral constituent, taking under the conditions of the experiment an average of 1,456 lbs. per acre of K_2O as compared with 491 lbs. of nitrogen and 111 lbs. of P_2O_5. The rate of growth was very similar on all plats, being slightly but not significantly greater on the potash areas. Potash constituted about 37, 32, and 45 per cent, respectively, of the total ash in the leaves, stems, and fruit. There was a very close similarity between the potash and total ash curves. The greatest content of total and reducing sugars was reached at fruiting time, being apparently correlated with the age of the plant. Starch content was highly variable, continuing to accumulate on some plats even during the time of fruit formation when large quantities of sugar were being produced. The ratio between nitrogen and calcium was observed to be fairly constant.

In respect to the influence of fertilizers on plant growth, nitrogen stimulated growth for a short time but did not appear to have an enduring influence. Phosphorus did not cause as large growth as did the other nutrients and in excess quantities actually depressed growth.

As a practical conclusion, the author recommends the shredding of pineapple waste with its return to the soil, since the cost of sufficient potash to offset that taken up by the plants would be prohibitive.

Experiments with hot-water treatment of daffodils in relation to forcing and field culture, D. GRIFFITHS (*U. S. Dept. Agr. Circ. 113* (*1930*), *pp. 36, pl. 1, figs. 18*).—Describing briefly the several pests that occur in narcissus bulbs and their relation to the welfare of the plant, the author discusses the hot water treatment of mature bulbs as a means of controlling these troubles.

In general it was found that bulbs are most effectively treated from 4 to 5 weeks after normal digging. Considerable varietal differences were noted in resistance to hot water injury, the self-yellow trumpets and certain of the

Barriis proving most resistant. Injury to flowers and even to foliage did not persist into the second year. In general flower injury occurred following early treatment and foliage and root injury late treatment. Injury to blooms was chiefly manifested in dwarfing and a distortion of the petals. Even after drying for 2 weeks narcissus bulbs withstood temperatures up to 113° F. with the time extended to 4 hours without serious injury.

Of the several pests the mite *Tarsonemus approximatus* was most serious, and the readiness with which stocks were infested suggested the need of periodical treatments. Hot water treatment from 2 to 3 weeks after digging at 106 to 108° for 2 hours eliminated the mite and all other animal organisms except the nema without injury. The mite appeared to be much less serious in regions of warm summers.

Doubling of the flowers of stocks, A. Laurie (*Ohio Sta. Bimo. Bul. 145 (1930), pp. 122–124*).—Dividing a lot of Beauty of Nice stocks into four lots according to vigor, there was recorded with ascending size 32, 40, 47, and 61 per cent of double flowered plants. Seed held for 3 years gave an unusual proportion of double flowers. That doubling is not altogether an inherent condition but is modified by the environment was shown also in studies with the Heatham Beauty and Bismarck varieties, where larger percentages of double flowered plants were secured in enriched soil. Similiar results were secured with other varieties by applying concentrated fertilizers in liquid form.

Color schemes of cacti, J. M. Breazeale (*Arizona Sta. Bul., 1930, pp. 34, pls. 4, figs. 2*).—The subject is discussed under the following headings: Analysis of cactus flowers, insect appeal, color phenomena, complementary colors, harmony in colors, contrast, background, variation in the color of flowers of the same species, color as determined by the acidity or alkalinity of the sap, and the point of view of the insect.

American medicinal plants of commercial importance, A. F. Sievers (*U. S. Dept. Agr., Misc. Pub. 77 (1930), pp. II+74, figs. 128*).—This publication, compiled largely from earlier Department papers, presents descriptive and other pertinent notes on a large number of American plants possessing medicinal properties.

FORESTRY

[Forestry at the Connecticut State Station] (*Connecticut State Sta. Bul. 318 (1930), pp. 758, 759*).—Some evidence was secured that pine needle litter when used alone has a harmful influence on the condition of the soil.

One-year storage of white pine seed, C. G. Bates (*Jour. Forestry, 28 (1930), No. 4, pp. 571, 572*).—Observations upon the germination of white pine seed dried to a determined condition and stored by the Lake States Forest Experiment Station in paraffin sealed and ventilated bottles suggested that 30 per cent relative humidity is a favorable moisture condition for seed storage. The best temperature was slightly above the freezing point, with gradual seasonal changes. The beneficial effect of low moisture was not greatly influenced by the temperature.

Cold storage prolongs life of noble fir seed, L. A. Isaac (*Jour. Forestry, 28 (1930), No. 4, p. 571*).—At the Pacific Northwest Forest Experiment Station it was found that noble fir seed loses its viability very slowly in cold storage, keeping from 3 to 5 years, as compared with 1 year at room temperature. Seed 58 per cent sound when placed in storage in 1921 yielded 34 and 13 per cent germination, respectively, in 1925 and 1926. Seed 38 per cent sound stored in 1926 germinated 21, 17.5, and 13.5 per cent in 1927, 1928, and 1929, respectively.

Seedling survival on burned and unburned surfaces, L. A. Isaac (*Jour. Forestry, 28 (1930), No. 4, pp. 569–571*).—Observations by the Pacific Northwest

Forest Experiment Station upon seedling survival on open areas showed that on a charcoal covered surface temperatures were excessively high, 144° F. killing all 10-day-old seedlings within 3 days. On a contiguous yellow soil plat the surface temperature rose to 125°, with only 42 per cent mortally injured in the 3-day period. The rapid and complete killing on the charcoal plats suggests difficult establishment on these burned-over areas, and the large loss on the yellow soil shows the general difficulties ordinarily encountered by tender forest seedlings.

Growing black locust trees, W. R. Mattoon (*U. S. Dept. Agr., Farmers' Bul. 1628 (1930), pp. II+14, figs. 10*).—A general discussion is presented upon the natural distribution of the species, uses of the tree and wood, cultural aspects, control of insects, harvesting and marketing of the crop, etc.

The application of silviculture in controlling the specific gravity of wood, B. H. Paul (*U. S. Dept. Agr., Tech. Bul. 168 (1930), pp. 20, pls. 12, fig. 1*).—Pointing out that moderate differences in the specific gravity may exert a very appreciable influence on the physical properties of any given species of wood, the results are presented of various studies of the effects of environmental and silvicultural factors on the specific gravity of both deciduous and evergreen species. Controlling the area per tree was found to be the most effective means of influencing specific gravity of the wood. In broadleaf species severe crowding decreased specific gravity, while reciprocally release was accompanied by an increase. In conifers specific gravity was found to depend primarily on the relative proportion of spring and summer wood in the individual annual growth rings. Conditions favoring an increase in summer wood favored an increase in specific gravity. For the production of a high specific gravity coniferous wood the author suggests that the stands should not be allowed to become too dense, fire should be excluded, and the fertility of the soil should be maintained.

DISEASES OF PLANTS

[Plant pathology at the Florida Station], R. W. Ruprecht, A. F. Camp, J. R. Watson, and W. B. Tisdale (*Florida Sta. Rpt. 1929, pp. 43, 51, 52, 54, 68–81, 97–101, figs. 5*).—Analyses of leaves and stems from normal and dieback affected trees showed the following characters in diseased leaves: (1) An increase in all forms of nitrogen, (2) a decrease in iron, (3) an increase in phosphoric acid, (4) a slight decrease in total and reducing sugars, dextrose, and soluble starch, and (5) a lower carbohydrate-nitrogen ratio. There was also an increase of calcium in the young shoots. In analyzing chlorotic leaves similar differences were found, except that carbohydrates were above normal.

The finding of cotton rust on plats receiving a complete fertilizer led to the conclusion that lack of potash can not be the sole factor predisposing cotton to this disease. A disease of cotton, *Fusarium moniliforme*, was found attacking both seedlings and bolls. Evidence was secured that potash even in large quantities does not markedly reduce the incidence of wilt on susceptible varieties.

In root knot investigations very good control was obtained by the use of formalin which controlled both nematodes and fungi but it was more expensive than sodium cyanide and ammonium sulfate. Calcium cyanide was not found equal to sodium cyanide in this treatment. Crotalaria because of its freedom from root knot made a good substitute for velvetbeans. The Victory cowpea, supposedly resistant to root knot, was found heavily infested.

Removal of the loose scaling bark and light scraping of the dark outer portion not only coincident with the lesion but well in advance of it followed by painting with lime sulfur wash proved an effective treatment for citrus trees affected with psorosis. Attempts to discover the causal organism of scaly bark were unsuccessful. Tests of various commercial oil emulsions plus Bordeaux mixture for the control of melanose showed the combinations to be more effective than oil alone. Observations are presented on the activities of citrus canker (*Phytomonas citri*) when grown in potato broth and upon the longevity of the organism in sterilized and unsterilized sandy and muck soils and concoctions. The relation between the citrus aphid and the fungus *Empusa fresenii* are discussed. It is believed that plus and minus strains of the fungus exist, the mingling of which in the aphid is responsible for the development of the resting spore.

Sclerotium rolfsii was found attacking sweetpotato sets before they were well rooted in the field, causing a 40 per cent loss. For controlling downy mildew of cucurbits it was found that copper fungicides were more effective than sulfur and should be applied as early as the true leaves develop. For controlling the nailhead rust of tomatoes copper fungicides appeared most valuable, as indicated by the vigor of the plants. Laboratory studies showed the nailhead fungus to be distinct both as an organism and in its resulting symptoms. Earliana proved very susceptible and Marvel very resistant, with other varieties ranging between.

Bordeaux mixture was effective in controlling leaf scorch of the strawberry but not for leaf blight. A fungus, *Colletotrichum* sp., was definitely proved the causal organism of strawberry anthracnose. Incompleted studies of the crimps of French bud disease of the strawberry suggested that the nematode *Aphelenchus fragariae* is the cause. Flooding strawberry beds apparently spread the disease, and roguing is considered a possible control.

Experimental work with the spindle tuber disease of the potato suggested that this disease may be spread by the cutting knife and also by the picker planter. The disease caused great reductions in yield, amounting to from 75 to 84 per cent in some cases. Copper lime dusts for late blight control increased the yield of potatoes slightly but delayed maturity. Rhizoctonia control by corrosive sublimate did not give significant increases in yield, and the dip-dust treatment caused decided injury. Three diseases of corn, namely, Diplodia rot, Fusarium dry rot, and Physoderma, were studied. The *F. moniliforme* isolated from soil was found parasitic on corn ears. Observations on Physoderma infection indicated considerable variability in resistance in varieties. Heavy rainfall and a small crop interfered with results of experiments on the control of pecan scab.

Investigations at the Tobacco Substation showed seed bed diseases to be most serious, and of these wildfire and scab were most prevalent. Tests of 150 selfed selections of tobacco for resistance to black shank (*Phytophthora nicotianae*) showed marked variability, ranging from 0 to 100 per cent resistance.

Plant diseases (*Nebraska Sta. Rpt. [1929], pp. 31–36*).—Finding no wilt on alfalfa plants in the first season, the author concludes that passing through a winter is necessary before infection is possible. Entrance was gained to the plant through winter injuries or through mowing wounds. Anatomical studies showed wilt to be present throughout the length of the plant axis in varying quantities, depending on the degree of the growing tissues. The trouble was chiefly vascular, although bacteria were occasionally found in the parenchyma and medullary rays. Extensive selections were made in an attempt to develop resistant strains. Under controlled temperatures marked variability was noted in the comparative hardiness of alfalfa varieties.

The results of a study of spindle tuber and other degeneration diseases of the potato are summarized and show that aphids are important factors in the spread of virus diseases. Of the four diseases studied, mild and rugose mosaic, leaf roll, and spindle tuber, the last was transmitted most rapidly and is considered the greatest menace. In addition to aphids, flea beetles, Colorado potato beetles, and tarnished plant bugs were found capable of transferring spindle tuber and unmottled curly dwarf. Flea beetles, leaf bugs, and grasshoppers did not carry mosaic and leaf roll. Field experiments showed the need of early roguing and of drying seed pieces after cutting. Spindle tuber juice diluted 1–1,000 caused infection, while that at 1–10,000 did not. Some transmission of unmottled curly dwarf occurred with the high dilution of 1–10,000. No evidence was secured that perennial solanaceous weeds overwintered spindle tuber and unmottled curly dwarf.

In studies of the control of seed-borne diseases of the potato, it was found that hot formaldehyde was consistently the most effective treatment. Mercuric chloride and organic mercurials, as judged by yields, were more effective in controlling Rhizoctonia than of scab. None of the organic mercury treatments consistently exhibited any beneficial effect on yield, exclusive of disease control. The soil was found to be an important source of scab and Rhizoctonia.

Formaldehyde-treated seed distributed throughout the potato region of western Nebraska was used as an index to soil infection and showed scab to average 53.1 per cent and Fusarium wilt 4.2 per cent. Preliminary experiments in the greenhouse to sterilize soil gave unfavorable results.

Attempts to control cherry leaf spot (*Coccomyces hiemalis*) by spraying were ineffectual, from 20 to 40 per cent infection following. Ascospores were ejected by the middle of May, and the poor results are deemed due to late spraying or poor fungicidal qualities of the spray.

Research in botany, B. W. WELLS ET AL. (*North Carolina Sta. Rpt. 1929, pp. 78–91, figs. 3*).—Summary accounts are given of investigations pursued during the year.

Tobacco mosaic, S. G. Lehman (pp. 78, 79).—Evidence was found in field tests that the common tobacco mosaic virus persists in the soil throughout the winter and enters young plants through their roots. Topping plants in the field greatly increased the percentage of mosaic-infected plants unless care was taken to avoid contamination.

Cottonseed treatments, S. G. Lehman (pp. 79, 80).—Favorable results were again secured (E. S. R., 61, p. 744) in the treatment of cotton, especially early planted cottonseed, with fungicidal dusts.

Soybean diseases, S. G. Lehman (pp. 80–82).—Of various fungicides used to treat soybean seed in an effort to control frog-eye disease, none gave good success. Soaking in water at 112° F. for 15, 20, and 25 minutes was also unsuccessful. The causal fungus readily overwinters on diseased plant refuse and on the seeds. Fall plowing was not effective in destroying the fungus. Laredo beans harvested in 1926 and planted in 1929 still carried the disease.

Oat smut control, S. G. Lehman (p. 82).—Oat smut was successfully controlled by a number of dusts, including Ceresan and Smuttox. Formaldehyde applied as a spray and mercuric chloride used as a dust almost completely prevented smut but injured the seed materially.

Wheat rust, S. G. Lehman (p. 82).—Most of the wheats grown in rust study plats developed a high percentage of rust at harvest time, but some of the selections were found more resistant. In studies of covered smut, the source of the fungi appeared an important factor, but certain wheats were more resistant than others to all the smut strains.

[*Sweetpotato disease investigations*], R. F. Poole (pp. 83–89).—The black rot (*Ceratostomella fimbriatum*) was found the most important disease of bank-stored sweetpotatoes. The soil was a source of infection but less important than the seed and plant. Spores were readily disseminated during the handling of the crop at harvest. A brown rot caused by *Sclerotinia* sp. and developing late in the storage season caused heavy losses in both bank and house storages. Infection by *Schizophyllum commune* was noted in one location and the isolation of the fungus accomplished. This rot also attacks pine, cherry, apple, peach, and plum. Treatment of potatoes inoculated with *C. fimbriatum* with Bordeaux mixture and certain dusts greatly reduced losses in bank storages. The chemicals were less effective with black rot, and poor results were obtained when diseased potatoes were treated just before banking. *Rhizopus nigricans* inoculated potatoes were benefited by treatment with hydrated lime and Bordeaux mixture in dust and liquid forms. A paste of finishing lime injured the roots.

Resistance of sweetpotatoes to *Fusarium batatatis* was directly correlated with plant vigor. Resistance of sweetpotatoes to scurf (*Monilochaetes infuscans*) was found associated with the arrangement of the potatoes on the stem, those varieties which set potatoes some distance out being most resistant. In these varieties the fungus in some cases did not reach the potatoes before harvest. Jersey and Porto Rico varieties were found resistant to nematodes, while Nancy Hall, Red Brazil, and related varieties were severely attacked. No physical characteristic could be directly associated with resistance.

Studying the growth of four fungi on various media, it was found that a sweetpotato-agar combination was generally favorable. Each of the four organisms had a distinct growth behavior, that of *F. batatatis* being described. In the field sandy soils proved a favorable environment for overwintering this fungus, while in clay and heavy loam the fungus failed to survive. The virulence of the disease was maintained since 1925 on sweetpotato media. Some indication was secured that Triumph and Red Brazil were losing their resistance. *M. infuscans* grew well on many plant media but slowly on beef extract and Cook's synthetic media. In manure and hay infusions growth was slow but profuse. Nitrogen fertilizers which caused potatoes to crack before harvest increased *C. fimbriatum* infection, and manure and legumes increased scurf by supplying a favorable growth medium.

Stem rot, black rot, and scurf, all seed borne and all living over in the soil, were checked by treatment of the stems with Bordeaux mixture just prior to transplanting. Scurf is described as superficial, being disseminated downward by gravity and water and in other directions by the mycelium. Puddling plants prior to transplanting greatly increased infection. Treating plants in finely divided sulfur just prior to planting greatly reduced scurf, being 1.7 per cent on treated, as compared with 67.2 on controls. Seed potatoes soaked in water and then treated with mercuric chloride were more slowly infected with scurf than the controls. Various other materials, including hot water, were tried but with no uniform results. Long continued treatments with mercury bichloride or formaldehyde injured the potatoes. Using sulfur, dolomite, and copper lime dust as bases for organic mercury, it was found that the best control was secured with sulfur as the base. With a dolomite base, organic mercury greatly retarded sprouting. With a copper lime base sprouting was only slightly reduced but little benefit was obtained.

Although equal in weight when harvested, scurfed potatoes lost weight rapidly in storage. Treatment of tubers at harvest with organic mercury, mercuric chloride, and sulfur dust reduced infection of the sprouts. Other disinfectants gave negative results. Pine sawdust and semianthracite coal ashes proved good bedding media.

Dewberry disease studies, R. F. Poole (pp. 89, 90).—Heavy applications of Bordeaux mixture after the canes were tied up in March and again 30 days before harvest did not control anthracnose of the dewberry. The disease was reduced by cutting out the old canes and influenced in severity by the seasons. Root rot (*Collybia dryophila*) was not controlled by any of various chemical treatments tested, and the plants were injured by even the weakest solutions. Progress was made in the selection of resistant plants. Cane blight (*Leptosphaeria coniothyrium*), a serious disease of dewberries in the sand-hill region, was found to gain entrance through pruning wounds made when the old canes were removed. Cutting these canes below the soil surface prevented infection and is recommended as a practical measure. The imperfect stage of the fungus was found throughout the year, and the perfect stage (rare) was collected in March and April on wood which had been killed the preceding season.

Plant ecological features of the sand hills, B. W. Wells and I. V. Shunk (p. 90).—Studies of the soil showed a rapidly declining capacity for supplying water, which condition resulted in a critical environment for many mesic plants, including agricultural crops.

Plant pathology and physiology (*Utah Sta. Bul. 220* (*1930*), *pp. 51–55, figs. 3*).—Continuing work on virus diseases (E. S. R., 61, p. 44), it is reported that seven distinct virus diseases of the potato, namely, rugose mosaic, mild mosaic, crinkle mosaic, leaf-rolling mosaic, spindle tuber, leaf roll, and witches'-broom, with possibly a supermild mosaic, have been observed. Another disease, psyllid yellows, induced by the feeding of the hopping plant louse, is considered a possible virus disease. All virus troubles reduced yields. The virus diseases, especially rugose mosaic, were observed to spread much more rapidly in certain areas than in others. The results with the tuber-unit method of testing seed stock were eminently satisfactory.

Bacterial canker (*Aplanobacter michiganense*) was found to be an important cause of tomato disease in commercial fields, and bacterial wilt of alfalfa was found to be rather prevalent in certain districts. It is suggested that proper rotations would have materially reduced losses.

Although it was found that psyllid yellows disease is produced during the feeding of *Paratrioza cockerelli*, the exact nature of the disease was not established. Some evidence was found that the etiological agent is not a distinct virus but possibly a toxin injected by the insect while feeding.

Studies on fungicides, I–III (*New York Cornell Sta. Mem. 128* (*1930*), *pp. 79, figs. 6*).—This paper is presented in three parts.

I. *Concepts and terminology*, H. H. Whetzel and S. E. A. McCallan (pp. 3–7).—The nature of the problem is discussed.

II. *Testing protective fungicides in the laboratory*, S. E. A. McCallan (pp. 8–24).—This part discusses the practicability and limitations of laboratory tests and briefly describes a method of testing developed at Cornell University, in which glass slides, sprayed or dusted with the fungicide under test, are placed in inverted moist chambers, with spore suspensions applied to certain slides and others left as checks. The need of uniform materials and controlled environment is stressed.

III. *The solvent action of spore excretions and other agencies on protective copper fungicides*, S. E. A. McCallan (pp. 25–79).—This paper deals with the results of a study of the effects of the dissolving action of spore excretions on the liberation of copper from insoluble copper protectants. In all the experiments copper protectants were definitely toxic only in those cases in which spores, or filtrates from suspensions of germinating spores, were able to maintain an aqueous connection with the protectant. Preliminary tests indicated that the spore excretions of *Sclerotinia americana* are very slightly acid, to the extent of about the equivalent of N/20,000 HCl.

In summing up the results of the study, the author asserts that spore excretions appear to be the chief agency in bringing about the liberation of copper from insoluble copper protectants. Various atmospheric factors, especially meteoric waters, may be supplementary agents, and calcium compounds, such as Bordeaux mixture and copper-lime dust, may play a rôle. It is thought possible that there may be an infinitely slight accumulation of copper from that which is presumably always present in equilibrium in even the most insoluble copper protectants.

Treatment for control of grain smuts, C. W. Hungerford (*Idaho Sta. Circ. 59 (1930), pp. 8, figs. 4*).—General information is presented on the copper carbonate dust, formalin, bluestone, hot water, and organic mercury treatments for controlling smut.

Damping-off of vegetable seedlings (*Connecticut State Sta. Bul. 318 (1930), p. 757*).—Excellent results were secured in the control of damping-off disease of vegetable seedlings by the use of acetic acid and formalin applied to the soil.

Effect of environmental factors upon the resistance of cabbage to yellows, J. C. Walker and R. Smith (*Jour. Agr. Research [U. S.], 41 (1930), No. 1, pp. 1–15, figs. 3*).—That temperature of the soil and surrounding air has an important bearing upon the behavior of cabbage in the presence of yellows (*Fusarium conglutinans*) was manifested in studies in Wisconsin. In the susceptible strains and mass-selected resistant varieties the typical disease symptoms appeared in increasing percentages with an increase in the soil temperature to about 28° C. (82.4° F.), and were retarded somewhat at 33°. In homozygous-resistant strains no evidence of disease was found up to 24° in naturally infested soil when young transplants were used. Disease symptoms developing at higher temperatures were not typically those of yellows, and the fungus was only rarely isolated.

Reinoculation of a steam-sterilized soil resulted in an increase of the inoculum and more rapid infection of susceptible plants but with no effect on the homozygous-resistant lines, except that the high-temperature symptoms developed at a somewhat lower temperature. Severe root pruning of transplants hastened the infection of susceptible plants but had no effect on resistant lines. The growing temperature prior to infection had no influence on the rate of disease development, nor on the stability of resistance in homozygous lines. Crosses between resistant and susceptible plants behaved as homozygous-resistant plants, except that the high-temperature effects occurred at a slightly lower temperature.

A cytological study of cabbage plants in strains susceptible or resistant to yellows, R. Smith and J. C. Walker (*Jour. Agr. Research [U. S.], 41 (1930), No. 1, pp. 17–35, pls. 3, figs. 6*).—Attempts to discover by cytological means morphological differences between resistant and susceptible roots that might account for resistance met with failure. In both resistant and susceptible plants *Fusarium conglutinans* entered largely through the intercellular spaces between the outermost cells of the embryonic portion of the root. The progress of the fungus through the root and stem was largely confined to the xylem tissue. All evidence pointed to the hypothesis that resistance must be entirely bound up with the chemical and physiological qualities of the protoplasm of the growing tips. Resistance in homozygous-resistant lines of cabbage prevailed throughout the embryonic and permanent root tissues. Temperature was again found to be a factor in resistance, homozygous-resistant plants losing their complete resistance above 26° C. At 28 and 30° the pathogene was largely confined to the root but at times extended to the aboveground portion and caused the death of the plant.

Cotton diseases in Florida, M. N. Walker (*Florida Sta. Bul. 214* (*1930*), *pp. 32, figs. 15*).—A general discussion of the more important diseases, their manifestations, destructiveness, and control. Directions for delinting cottonseed, by A. F. Camp, are included.

Potash in relation to cotton wilt, M. N. Walker (*Florida Sta. Bul. 213* (*1930*), *pp. 10*).—Tests made in a field near Gainesville where the soil was heavily infested with *Fusarium vasinfectum* showed that potash was of little direct value in reducing the infection of cotton. In the case of a susceptible cotton variety it was not possible to increase yields sufficiently to offset the high mortality. The author believes that whatever increases are obtained from the use of fertilizers in moderately infected fields are not attributable to any particular constituent of the fertilizer. For Florida conditions it is recommended that only resistant cottons be utilized on wilt-infested soils and that a complete fertilizer containing from 3 to 5 per cent of potash be applied. The fertilizer treatment is also advantageous in reducing the so-called rust of cotton.

Kale yellows in California, caused by Fusarium conglutinans Wollenw., J. B. Kendrick (*Hilgardia* [*California Sta.*], *5* (*1930*), *No. 1, pp. 15, figs. 4*).—Kale yellows, a disease characterized by a progressive yellowing and dropping of the older leaves, causes serious losses in the Petaluma district, where kale is largely grown as a food for poultry. By careful morphological and pathogenic studies the author found that the disease was the same that causes cabbage yellows, the causal fungus being soil borne and hence difficult to control. A number of resistant plants were found in badly infested fields, and satisfactory progress was made in the development of resistant strains comparable to those existing in cabbage. Temperature was observed to be an important factor in the development of the disease, many of the affected plants dying under high temperatures, whereas under relatively low temperatures such plants might continue to grow in a stunted, weakened condition.

How to treat seed potatoes, C. W. Hungerford (*Idaho Sta. Circ. 58* (*1930*), *pp. 8, figs. 6*).—This contains general information as to disease control.

A control of sweet potato scurf, R. F. Poole (*North Carolina Sta. Bul. 274* (*1930*), *pp. 4, figs. 3*).—This is a summary of Technical Bulletin 38, previously noted (E. S. R., 63, p. 546).

A control for sweet potato wilt or stem rot, R. F. Poole (*North Carolina Sta. Bul. 273* (*1930*), *pp. 4, figs. 3*).—A protective treatment is described in which the stems and roots of disease-free plants are dipped in Bordeaux mixture just prior to planting in the field. The disease-free plants were obtained either from vine cuttings or by growing plants in disease-free soil. Where scurf and wilt are both present in the soil mercurichlorophenol is recommended as the most successful disinfectant.

The canker disease of tomato, R. C. Thomas (*Ohio Sta. Bimo. Bul. 145* (*1930*) *pp. 116–122, figs. 3*).—Causing destructive injury in greenhouses but rarely any appreciable loss in the field, the canker disease of the tomato is described as bacterial in nature, capable of spreading through the seed or by the hands in the ordinary operation of removing surplus shoots. The prompt removal of diseased plants is considered of prime importance, and if once thoroughly established in the greenhouse steam sterilization is recommended. Careful sanitation is urged to prevent the rapid spread of the disease.

A maple leaf disease caused by Cristulariella depraedans, P. R. Bowen (*Connecticut State Sta. Bul. 316 (1930), pp. 621–647, pls. 8*).—A fungus disease was found attacking *Acer saccharum* and *A. saccharinum* in southern Connecticut, in September, 1928. Leaves exhibiting the beginning stage of the disease had small, circular, flaccid, grayish spots. Activity of the fungus, favored by warm, very moist weather conditions, caused these spots to increase in size and merge, thus producing large, irregular, wilted areas. Scattered on the surface of the leaves were white fruiting bodies, scarcely visible to the naked eye, which looked like insect eggs. Microscopic studies of cultures obtained from infected leaves indicated that the pathogene was *C. depraedans*, hitherto reported only in England and Germany. Further evidence for this conclusion was found (1) by comparison with a diseased, preserved leaf of *A. pseudoplatanus* received from the Herbarium of the Royal Botanical Gardens, Kew, London; (2) by inoculation of potted maple trees placed in humid chambers; and (3) by examination of paraffin sections cut from diseased leaves collected in the field, and from leaves inoculated in the greenhouse.

Timber-rot in the pepper tree, Schinus molle, J. G. Brown (*Arizona Sta. Bul. 132 (1930), pp. 442–454, pls. 8, figs. 2*).—Outwardly manifested as scattered dead branches in the tree top, timber rot greatly mars the beauty of the pepper-tree. This paper discusses the symptoms, cause, and control of the disease, and gives a technical description of the organism here designated as *Inonotus schini* of the class Basidiomycetes and the family Polyporaceae.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Common injurious mammals of Minnesota, M. S. Johnson (*Minnesota Sta. Bul. 259 (1930), pp. 67, figs. 10*).—In this bulletin a brief description is given of each of the common injurious mammals in the State, its habits, relative abundance and distribution, and methods of destroying it or preventing damage by it. The subject is dealt with under the headings of rodents, insect eaters, small flesh eaters, and larger flesh eaters. The appendix includes a list of the types of damage done by mammals with suggestions as to animals most likely to be responsible and a key to the families of mammals discussed.

Cottontail rabbits are insectivorous, R. D. Bird (*Jour. Mammal., 11 (1930), No. 2, p. 240*).—Rabbits (*Sylvilagus floridanus alacer*) were found to feed on the cocoons of the cecropia moth during January, 1930.

The behavior of certain spermophiles with special reference to aestivation and hibernation, O. Wade (*Jour. Mammal., 11 (1930), No. 2, pp. 160–188, pl. 1, figs. 8*).—A somewhat extended account presented in connection with a list of 42 references to the literature.

Cycles in the numbers of British voles (Microtus), A. D. Middleton (*Jour. Ecology, 18 (1930), No. 1, pp. 156–165, figs. 2*).—The author finds that past maximum years for field voles (*M. agrestis* and *M. hirtus*) show a regular periodicity of approximately four years. The causes of this cycle are not yet fully understood, but there is evidence that disease is the controlling mechanism in some instances and that climatic factors are also involved.

Hints on wolf and coyote trapping, S. P. Young (*U. S. Dept. Agr. Leaflet 59 (1930), pp. 8, figs. 3*).—A practical account of methods of control.

English sparrow control, E. R. Kalmbach (*U. S. Dept. Agr. Leaflet 61 (1930), pp. 8, figs. 7*).—This account supersedes Farmers' Bulletin 493, by Dearborn, published in 1912 (E. S. R., 27, p. 254) and revised in 1917.

[Occurrence of and work with economic insects] (*Connecticut State Sta. Bul. 318 (1930), pp. 753, 754, 757, 758*).—Brief reference is made to the work with the gipsy moth, satin moth, European corn borer, Japanese beetle, Asiatic beetle, mosquito, Mexican bean beetle, and squash vine borer.

[Work with economic insects at the Florida Station] (*Florida Sta. Rpt. 1929, pp. 50, 51, 53, 54–58*).—Work with the boll weevil is reported on by A. F. Camp and on other insects by J. R. Watson.

Further information (E. S. R., 62, p. 354) was obtained on the cost and effectiveness of early season poisoning, based upon 60 individual tests scattered throughout the cotton-growing area of the State and 52 one-eighth acre plats located at the station. It led to the following recommendations for the most effective and economical method of poisoning: "Begin poisoning with sirup mixtures or powdered calcium arsenate as soon as the cotton first squares, continuing at weekly intervals for about four weeks, by which time practically all of the weevils emerging from hibernation have found their way to the cotton fields. Continue poisoning with calcium arsenate dust until the crop is set if the weevils continue to be plentiful. Calcium arsenate may be diluted with hydrated lime, making a 50–50 mixture, for use in the dusting machines. For use in mopping with sirup mixtures calcium arsenate should not be diluted with hydrated lime, since such a mixture cakes on the plants and becomes ineffective."

The actual time of arrival of hibernating weevils in the fields was determined for the fourth successive season by periodic examinations of cotton plants in plats exposed to infestation. The period of heavy emergence again extended from late in May through June, indicating that early season poisoning should start with the formation of squares and continue through the month of June. In hibernation studies conducted with 55,000 weevils placed in low temperature incubators a large percentage was satisfactorily held through the winter. By June 30 as high as 20 per cent of several groups of 1,000 weevils each, placed in the incubators in October and November, were alive, which is considered to show that they can be carried through the winter for use in experimental work the following spring.

Studies of the resumption of oviposition by the hibernated weevils indicated that fertile eggs could be laid without a preliminary 5-day square diet. Longevity records indicated that the individual weevil could live 257 days without food during hibernation, 143 days after emerging from hibernation, and a total of over 372 days. This is, respectively, 17, 13, and 37 days longer than the previously cited records. An isolated weevil was found to lay eggs as many as 201 days, nearly 7 months, after mating, indicating that females are able to lay fertile eggs on emerging from hibernation. A new apparatus for determining the thermotropic reaction of insects was devised.

The velvetbean caterpillar appeared in destructive numbers on peanuts in the Everglades, apparently forced to do this through the absence of other host plants. Life history work had previously shown that they could complete their development on peanuts, but never before had the moths been observed laying eggs on peanuts in the field. Damage to the peanut plantings was extensive, and control measures were complicated by the fact that arsenicals are extremely injurious to Everglade soils. Calcium fluosilicate was tried and found on the whole to give satisfactory control.

In control work nicotine sulfate-lime dusts which furnish the most economical control of the green citrus aphid (*Aphis spiraecola*) were not effective in the control of the Florida flower thrips (*Frankliniella tritici bispinosa*) through failure to penetrate the bloom sufficiently.

Reference is made to the attempted introduction from Cuba and establishment of a tachinid parasite of the sugarcane borer.

Observations of the larger plant bugs which damage citrus fruit in the fall (E. S. R., 62, p. 351) have shown that a mixture of beggar weed and Crotalaria is a dangerous combination in a citrus grove, since plant bugs breed on beggar weed all summer and after this dies or matures in the early fall they migrate to Crotalaria, often in sufficient numbers to take the pods all off, in which case there may be a second migration to citrus. The abundance of parasites, particularly the tachinid fly *Trichopoda pennipes*, has, however, greatly reduced the number of plant bugs in many groves where Crotalaria is grown.

In combating the bean jassid (*Empoasca fabae*) a pyrethrum compound consisting of 1 oz. to 4 gal. of water and soap applied at the rate of 6 lbs. to 50 gal. destroyed 100 per cent of the insects hit by the spray. When used at the rate of 1 oz. to 8 gal. with 6 lbs. of soap to 50 gal., 60 per cent of the insects were killed. The results indicate that liquid sprays are more effective in the control of these jassids than are the dusts.

In further work with *A. spiraecola* (E. S. R., 62, p. 351), in which particular attention was paid to the climatic conditions which bring about infestation, it appeared that the critical factor in the weather was the mean temperature during January. When above 60° F. in that month, aphid outbreaks are apt to occur the following spring, although they may be prevented by a severe freeze which cuts off their food supply or by heavy dashing rains. The thorough clean-up of aphids on young trees during the winter, particularly in January, combined with the pushing of the spring growth by cultivation and fertilization, were shown to be very effective in preventing an outbreak. One of the most important developments of the work of the year was the discovery of spreaders, including an oil derivative and various oleates, that will reduce the cost of nicotine sprays as aphicides by half.

In work with the nut case bearer of pecan, summer sprays gave absolutely no control. The shuck worm was scarce in the 1928 season, due apparently to the eggs being washed off the nuts before hatching. Predatory insects accounted for about 10 per cent of the overwintering hibernacula of the leaf case bearer. A brief mention is also made of observations of the Surinam roach, the intermediate host of Manson's eye worm.

[Insect control work by the Nebraska Station] (*Nebraska Sta. Rpt.* [*1929*], *pp. 25, 26*).—In a study made of the life history and control of the potato flea beetle in western Nebraska and of other injurious species in the seed potato growing districts, the potato flea beetle was found to be by far the most numerous, there apparently being two generations annually. *Systena taeniata* was also present, but usually much less commonly.

A life history laboratory was established in the college orchard in order to determine the period of development of the brood of eggs, larvae, pupae, and moths of each generation of the codling moth in southeastern Nebraska, with a view to determining the proper time for spray applications. In 1928 the codling moth was found to pass through three generations, of which only the first-brood larvae were very numerous. The correct times for application of the first and third cover sprays were indicated as June 23 and July 27, respectively, at the time of hatching out of the larvae of the first two broods.

[Work in entomology at the North Carolina Station] (*North Carolina Sta. Rpt. 1929, pp. 117–120, 121*).—In a study by Z. P. Metcalf in the peanut sections of the State six species of leafhopper were found doing more or less damage, causing a disease known locally as "pounts," which resembles in its general aspects the "tipburn" which it causes in potatoes. A second species which is common on a variety of grasses is frequently injurious in fields that have not been properly cultivated. A third species, the so-called clover leafhopper, seems to be increasing as a peanut pest and may prove to be of economic importance.

In experimental work conducted by B. B. Fulton, to determine the effect of planting time on the corn ear worm injury, corn planted April 20, May 1, May 10, and May 20 showed, respectively, 92, 96, 97, and 98.5 per cent of the ears infested. The slight benefit in favor of the earliest planted corn was, however, more than offset in the early summer by a heavy infestation of the larger cornstalk borer, which was somewhat less severe in the corn planted May 1 and caused very little damage to corn planted May 10 and May 20. The southern corn rootworm also caused more severe injury to the earlier planted corn. In experiments for the control of the corn ear worm on sweet corn several devices were tested, cheesecloth covers giving the best protection, although the number of tests was so small that further experiments will be necessary before any conclusions can be drawn as to the value of mechanical protectors.

In work on wintering of bees, by F. B. Meacham, colonies containing as few as 15 oz. of bees were carried through the winter in the packing case, and unprotected ones with 1 lb. 1.5 oz. These did not have surplus honey the following spring.

Observations, by Fulton, on host selection by the harlequin bug led to recommendations for the growing of a winter crop of rutabagas to serve as a trap crop in the spring and to attract the bugs away from cabbage, collards, and other crops. Further experiments on the use of soap solutions against the harlequin bug (E. S. R., 61, p. 752) have shown that the killing efficiency of such sprays is indirectly proportional to the rate of atmospheric evaporation. Two per cent solutions of several brands of white laundry soaps have been shown to be nearly 100 per cent effective in killing harlequin bugs hit by the spray under conditions of less than 0.008 cc. of evaporation per minute from a standard atmometer bulb. In the light of these results it has been recommended that spraying for them with a 2 per cent soap solution should be done only on very humid days or early in the morning when dew is on the plants and never when a strong breeze is blowing. It was found that the soap solution killed the harlequin bugs only when it penetrated deeply into the tracheae, the adults having spiracles equipped with closing devices which impede the entrance of the soap solution.

Work on the corn rootworm, by Metcalf, and on the taxonomy and biology of the leaf-cutter bees, by T. B. Mitchell, is briefly noted.

A review of the present position with regard to soil insecticides, H. W. Miles (*Jour. Bath and West and South. Counties Soc., 6. ser., 3 (1928–29), pp. 15–38, pls. 3*).—This is a digest of the literature presented in connection with a list of 47 references.

The uses of naphthalene for the control of certain pests of market gardens, L. N. Staniland and C. L. Walton (*Jour. Bath and West and South. Counties Soc., 6. ser., 3 (1928–29), pp. 209–211*).—Naphthalene of the type known as "whizzed" which has proved to be particularly suitable for broadcasting, controlled *Psylliodes chrysocephala*, the carrot rust fly, and *Blanjulus* sp. "In the case of *P. chrysocephala* the growers at two centers found it necessary to make six applications, one at the 1-oz. rate and the remainder at the 0.5 oz., all prior to setting out the plants. For celery the number of dressings varied at the different centers, ranging from three to five, all in the seedling and pricking out stages. For potatoes only one application was made, at 1 oz. per square yard, and dug in."

Airplane dusting for the control of forest pests [trans. title], K. Escherich (*Flugschr. Deut. Gesell. Angew. Ent., No. 12 (1929), pp. 60, figs. 22*).—

This account of the airplane application of insecticide, largely in Germany, includes a list of 42 references to the literature.

A new species of bean leafhopper from Haiti, D. M. DeLong (*Canad. Ent., 62 (1930), No. 4, pp. 92, 93, fig. 1*).—Under the name *Empoasca fabalis* n. sp., a leafhopper which is abundant upon beans and sweetpotatoes and is the most important species of economic leafhopper in Haiti upon truck crops is described.

An outbreak of the mealybug Phenacoccus hystrix (Bär.) Ldgr. in the vine region of Moselle, Saar, and Ruwer [trans. title], H. Zillig and L. Niemeyer (*Arb. Biol. Reichsanst. Land u. Forstw., 17 (1929), No. 1, pp. 67–101, pls. 3, figs. 3*).—The mealybug *P. hystrix*, recorded as an enemy of the horsechestnut and other trees, has appeared in Germany in destructive numbers since the fall of 1926 on grapevines in the Moselle, Saar, and Ruwer district. The studies of the insect and means for its control include a list of 28 references to the literature.

[Work with the tomato psyllid at the Utah Station] (*Utah Sta. Bul. 220 (1930), p. 42*).—Life history studies of the tomato psyllid (*Paratrioza cockerelli* Sulc.) conducted in continuation of those reported by Pack (E. S. R., 63, p. 251), are summarized from observations made during April, May, and June, 1930. Mating occurs in from 2 to 4 days after the psyllids become adult and at intervals thereafter. Mating requires from 4 to 14 minutes. The preoviposition period ranges from 5 to 19 days. Ten females laid 3,109 eggs; five others did not oviposit. Individual females laid from 41 to 1,151 eggs and as many as 61 in 24 hours. The oviposition period ranged from 6 to 55 days. The eggs rest on the stalks or pedestals, secreted by the females. Incubation records were kept on 4,220 eggs, about 75 per cent of which hatched in from 4 to 8 days. Nymphs passed through five instars in from 16 to 19 days, requiring from 2 to 7 days for each instar. The length of life in females varied from 2 to 68 days, with an average of 29.1 days. Males averaged 19.5 days, ranging from 2 to 35 days. This work is being conducted in cooperation with the U. S. D. A. Bureau of Entomology.

Bionomical investigation of English mosquito larvae, with special reference to their algal food, L. J. Howland (*Jour. Ecology, 18 (1930), No. 1, pp. 81–125, figs. 10*).—In the course of the study reported, 8 ponds in the neighborhood of Farnham Royal, Buckinghamshire, were examined and larvae of mosquitoes collected from them. The contents of 1,032 larvae were examined and the frequencies of the algae in the guts noted. "The larvae were also measured. The temperature, pH values, and CO_2 content of the ponds were noted. No definite correlation has been found between the number of larvae found and the pH and CO_2 content of the water. There is no definite correlation between the size of the larvae and the size of the algae eaten. There appeared to be no decided preference for any one kind of food by the larvae in any one pond, but the species of larvae found in a pond seemed to be related to the algal flora. The larger species, such as *Culicella morsitans* and *C. fumipennis*, occurred in ponds having a large algal growth. Apparent correlations between the spring and summer phases of algae and the appearance of larvae were noted. The culicines eat more algae than the anophelines. This does not agree with Senior-White's observations in India [E. S. R., 59, p. 657]." A list of 26 references to the literature is included.

Insect pest, climate, and control: Observations during the outbreak of the nun moth in Saxony, particularly in the Zittauer Stadtwald, as well as old and recent experiments [trans. title], E. Knoche (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1929), No. 4, pp. 705–775, figs. 7; abs. in Rev. Appl. Ent., 17 (1929), Ser. A, No. 6, pp. 334, 335*).—This is an extended account of studies of *Lymantria monacha* L. in Germany, 32 per cent of the larvae of which were found parasitized in 1921 by a tachinid, *Parasetigena sylvestris* R.-D (*P. segregata* Rond.).

Life history of the oriental fruit moth in Virginia, LeR. Cagle (*Virginia Sta. Bul. 270* (*1930*), *pp. 48, figs. 14*).—This bulletin reports upon studies of the life history of the oriental fruit moth conducted at Leesburg in 1924 and 1925 and at Blacksburg from 1926 to 1929, inclusive, in continuation of those of Stearns at Leesburg in 1919 and 1920 (E. S. R., 46, p. 659). A large part of the data on the incubation period of eggs, the feeding period of larvae, and the length of the pupal period for the four full broods for each year is presented in tabular and chart form. A table is given showing the time of leaving the fruit by wintering larvae of all broods. A review of the studies, which follows, includes a tabular summary of the life history data. The relation of twig infestation to fruit infestation, burying of larvae, time of leaving fruit by wintering larvae in the orchard and in the packing house at Bonsack in 1929, and apples as a host for wintering larvae are then considered.

The studies of apples as a host for wintering larvae of this pest indicate that during midsummer the moths are attracted to peaches in much larger numbers than to apples, but that this condition is reversed in the fall with the result that there may be a migration of moths to the apple orchard from the peach orchard; that the time of picking Elbertas with relation to the leaving of the fruit by third-brood larvae may influence the number of moths of the third brood which migrate to apples; and that apples in peach orchards containing no varieties of peaches which ripen later than Elbertas constitute an important source of wintering larvae.

A season's work on the colonization in Ontario of Macrocentrus ancylivora Rohwer, a parasite of the oriental peach moth (Laspeyresia molesta Busck), W. E. Steenburgh (*Canad. Ent.*, *62* (*1930*), *No. 4*, *pp. 71–75*, *fig. 1*).—In colonization work with *M. ancylivora* in Ontario this important parasite found suitable breeding conditions in the Niagara Peninsula in 1929, multiplied, and spread over an approximate area of 35 square miles.

Potato flea-beetles, H. H. Jewett (*Kentucky Sta. Bul. 297* (*1929*), *pp. 281–301, figs. 7*).—This bulletin deals particularly with studies of the life history of the eggplant flea beetle (pp. 286–292) and the potato flea beetle (pp. 292–299). Of these the eggplant flea beetle is the more important in Kentucky as a pest of potatoes because it occurs in much larger numbers, the potato flea beetle not having been observed as a serious pest of potatoes in the State. A third species, the tobacco flea beetle, is generally present on potatoes but is less numerous than the potato flea beetle.

The beetles collect on the vines about May 1 when the plants are just coming through the soil and may be found on them until cold weather in the fall. The period that elapses from the time the egg is laid until the appearance of the adult is practically identical for the two species, it generally being from 30 to 45 days. Two broods developed during the seasons of 1925 and 1928, there being some overlapping of broods at mid-season. The beetles generally crawl under litter in the fields in the fall and later enter the soil to hibernate.

The application of an arsenical, either lead arsenate 4 lbs. in 100 gal. of water or calcium arsenate 3 lbs. in 100 gal. of water, is suggested as a means of control.

Neodiplogaster pinicola, n. sp., a nema associated with the white-pine weevil in terminal shoots of the white pine, G. Steiner (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 2*, *pp. 125–130*, *fig. 1*).—A nematode found living in the moist frass of the mines produced by the white pine weevil in terminal shoots of white pine, on the eggs and larvae of which it is thought to prey, is described as new under the name *N. pinicola*. The affinities of this and other genera of the Diplogasteridae are reviewed.

The alfalfa-seed chalcis-fly in Utah, 1926–29, inclusive, C. J. Sorenson (*Utah Sta. Bul. 218 (1930), pp. 36, figs. 9*).—This account is based in large part upon the results of investigational work conducted during the 4-year period 1926 to 1929, inclusive, for the most part at the Uintah Basin Alfalfa Seed Substation at Fort Duchesne, Utah.

Damage to alfalfa seed is caused by the larvae of this chalcid feeding on the young, soft seed contents, the entire kernel of the seed being devoured. "Examination of seed samples from 75 representative fields in 1926 showed an average infestation of 9.13 per cent. In 1927 the average infestation found in seed samples from 90 fields was 9.75 per cent, in 1928 123 samples were found to contain an average infestation of 11.51, and in 1929 samples from 179 seed fields showed an average infestation of 24.37 per cent. The principal host plants of the seed chalcid fly are alfalfa, red and crimson clover, and several bur clovers. The chalcid fly is found in all parts of Utah, in most sections of the United States, and in other parts of the world where alfalfa or clover seed is grown. . . .

"As a result of life history studies in the Uintah Basin, it has been found that the greatest number of eggs hatch in 4 days. The feeding period of larvae averaged 4 days. The pupal period of summer broods averaged 11.8 days, and overwintering broods averaged 16 days. The period from eggs to adults averaged 23 days in summer. Two complete broods and a partial third brood of chalcid fly larvae have been found annually in the Uintah Basin."

The studies have shown that chalcid fly damage may be partially prevented by planting recleaned seed; feeding, composting, or burning chaff stacks before May 1; preventing volunteer alfalfa from seeding; obtaining a uniform setting and ripening of seed; and timely and efficient harvesting of the crop. Control of the chalcid fly may be effected by destroying the shattered seed remaining in the fields. This may be accomplished by cultivation which will bury this shattered seed to a depth of 2 to 2.5 in., or by proper burning over of seed fields with a burning machine. Four species of natural parasites have been found during this investigation, but they do not occur in sufficient numbers, however, to be of importance in control. The most important control factor is "cooperation on the part of all seed growers of a district in carrying out a definite uniform program of prevention and control."

The diseases of bees, C. Toumanoff (*Les Maladies des Abeilles. Paris: Vigot Bros., 1930, pp. VII+267, figs.* [69]).—An introduction is followed by a general account of the rôle of microorganisms of the diseases of insects in general. The diseases of the brood (pp. 26–92) and of adults (pp. 93–258) are then dealt with at length. A list of 98 references to the literature is included.

ANIMAL PRODUCTION

Study of the effect of the ration on health, reproduction, and ability to rear the young, J. O. Halverson and F. W. Sherwood (*North Carolina Sta. Rpt. 1929, pp. 74–77*).—Continuing this study (E. S. R., 59, p. 761), it was found that a cereal ration combined with skim milk powder, wheat germ, and Valentine's meat residue without whole milk and green cabbage was not successful for permitting rats to rear their young.

[Injurious effects of sugar beets and their by-products when used for feeding livestock] (*Utah Sta. Bul. 220 (1930), p. 35*).—This study has been in progress for 2 years (E. S. R., 61, p. 58). Observations during that period have led to the belief that sugar beets and their by-products are not injurious to livestock when properly fed and that direct poisonous properties have resulted from spoilage or contamination of these feeds.

Report on inspection [of] commercial feeding stuffs, 1929, E. M. Bailey et al. (*Connecticut State Sta. Bul. 317* (*1930*), *pp. 649–748+XIX*).—This is the usual report of the guaranteed and found analyses of 947 samples of feeds inspected during the calendar year 1929 (E. S. R., 61, p. 558).

[Experiments with beef cattle at the Nebraska Station] (*Nebraska Sta. Rpt.* [*1929*], *pp. 26, 27, 45, 46*).—The results of experiments in continuation of those previously reported (E. S. R., 61, p. 857) are noted.

Fattening cattle.—Long yearling steers were divided into 3 lots and fed for 135 days on the following rations: Lot 1, shelled corn and alfalfa hay; lot 2, ground snapped corn and alfalfa, 89 days, ground ear corn and alfalfa, 21 days, and ground ear and ground shelled corn plus alfalfa, 25 days; and lot 3, shelled corn, alfalfa, and cane molasses, self-fed. The steers in lot 2 gained 18 lbs. less per head and the cost of a unit of gain was higher than in lot 1. However, the animals in lot 2 appeared to carry more finish, sold for a slightly higher price per pound, and outdressed the steers in lot 1 by 1.42 per cent. In lot 3 the steers consumed about 2 lbs. of molasses per head daily and gained about 2 lbs. more per head, but the cost of a unit of gain was greater than in lot 1. The average loss per head in the respective lots was $1.30, $6.29, and $6.26.

Factors affecting the production and quality of meat.—A group of range Hereford cows, averaging 12 years of age, was full fed a ration of ground corn, silage, and alfalfa hay. Three animals were slaughtered at the beginning of the experiment and 3 at 35-day intervals over a period of 105 days.

At the beginning of the test the slaughtered animals were almost devoid of fat, and what little was present was yellow in color. As the feeding period progressed, the fat covering improved in quantity from 14.65 to 38.02 per cent, the water content decreased from 68.4 to 45.85 per cent, and the color of both lean and fat improved. The dressing percentage increased from 46.56 per cent for the first animals slaughtered to 53.65 per cent for those killed after 105 days' feeding. An improvement in juiciness, flavor of fat, and tenderness was noted between the fed cows and those killed at the beginning of the test, and some improvement in flavor of the lean and in aroma was observed.

Wintering range steers [*at the Scottsbluff Substation*].—In this study 5 lots of steer calves averaging approximately 339 lbs. each were put in dry lot on December 3, removed to pasture May 18, and taken off pasture October 20. While in dry lot the respective lots received the following rations: Lot 1 alfalfa hay, lot 2 alfalfa hay and beet tops, lot 3 alfalfa hay and 2 lbs. of dry pulp, lot 4 alfalfa hay and corn silage, and lot 5 corn silage and 0.75 lb. of cottonseed cake. During the summer they all grazed the same pasture.

The average winter gains were 60, 161, 142, 122, and 149 lbs. per head, and the average summer gains 185, 158, 174, 188, and 169 lbs. per head in the respective lots. The cost of winter feed was lowest in lot 2, followed in ascending order by lots 1, 4, 3, and 5, and the profit per calf was highest in lot 2, followed in descending order by lots 4, 3, 5, and 1.

Beef cattle [*at the Valentine Substation*].—It was found that for calves being wintered to sell off grass the following summer a ration that produced a gain of from 0.75 to 1 lb. per head daily was the most profitable. Adding cottonseed cake to a ration of prairie hay at the rate of 0.5 to 1 lb. daily increased the profit more than $5 per head over feed cost. The use of 1.5 lbs. of cake was less profitable than the use of 1 lb. of cake. The good results obtained with mixed clover hay indicated that the improvement of native hay through the seeding of clover would be profitable.

[Experiments with beef cattle at the North Carolina Station], E. H. Hostetler (*North Carolina Sta. Rpt. 1929, pp. 57–59, figs. 2*).—Results of several experiments are noted.

Quality of meat.—A group of calves out of native cows sired by a purebred Hereford bull and a group of calves out of native cows sired by a native or scrub bull were full fed at the Blackland Substation shelled corn, cottonseed meal, and soybean hay for 170 days (E. S. R., 59, p. 762). The first group made an average daily gain of 1.81 lbs. per head and consumed 479 lbs. of grain and 408 lbs. of hay for each 100 lbs. of gain. The second group gained at the rate of 1.48 lbs. per head daily and required 543 lbs. of grain and 441 lbs. of hay to produce 100 lbs. of gain. When marketed the grade calves averaged 631 lbs. per head and carried more finish than the native calves, which weighed only 534 lbs. The grade calves also sold for 71 cts. more per hundred weight than the native calves.

Pasture value of native reeds.—A pasture of approximately 150 acres of reed growth (*Arundinaria tecta*) at the Blackland Substation furnished abundant grazing from June 8 to January 1 for 29 native cows and 2 bulls. During this period, 27 of the cows suckled calves for 6 months, and the 29 cows made an average gain of 67 lbs. per head.

Comparison of carbonaceous roughages.—Two groups of 13 steers each were full fed for 136 days at the Piedmont Substation on a basal ration of equal parts of shelled corn and cottonseed meal. In addition lot 1 received cottonseed hulls and lot 2 corn stover. The steers in lot 1 required 57 lbs. less corn and 57 lbs. less cottonseed meal and slightly less roughage than lot 2 for each 100 lbs of gain.

Vitamin A studies.—In this study, made in cooperation with J. O. Halverson, 5 steers were fed an experimental ration of cottonseed meal, cottonseed hulls, beet pulp, and minerals, beginning on January 8, to determine whether a ration composed largely of cottonseed meal was deficient in vitamin A. A sixth steer was killed as a control. Up to April 30 all the steers appeared to be healthy and vigorous and had made good gains, but when weighed on this date a decided decrease in gain was found as compared with weights taken 28 days earlier. After this date the steers began to lose weight, and by June 30 2 were dead and 2 others swollen and emaciated. Post-mortem examination of the animals that died showed an extremely edematous condition, particularly around the joints and in the flank and brisket regions.

The cost of wintering steers preparatory to summer fattening on pasture, A. L. Shealy (*Florida Sta. Rpt. 1929, p. 39*).—On a roughage ration of beggarweed hay and peanut hay and a concentrate ration of equal parts of ground snap corn and velvetbean meal, 20 steers made an average daily gain of 0.33 lb. per head during a 91-day period. The average daily consumption of feed was 7.7 lbs. of hay and 2.41 lbs. of concentrates per head. Based upon the market price paid for the feeds, it was found that the cost for feed per steer daily was 13.8 cts.

Sweet clover hay for beef cattle—fattening baby beeves and two-year-old steers, O. M. Kiser and W. H. Peters (*Minnesota Sta. Bul. 261 (1930), pp. 28*).—The results of 7 years of experimental work at the Crookston Substation on the utilization of sweetclover, roughages for wintering stocker cattle, fattening baby beef calves, and fattening 2-year-old steers are reported in this publication. Some of these studies have been previously noted (E. S. R., 58, p. 866).

For stocker cattle good quality sweetclover hay proved to be almost equal to alfalfa hay in winter rations and produced considerably more gains than wild hay. Adding corn silage to a ration of sweetclover hay and oat straw materially reduced the cost of wintering steers.

In the studies with baby beef, ground shelled corn produced somewhat larger gains and a higher degree of finish than ground barley, but was not as economical a feed. Ground barley was more satisfactory than ground oats, and replacing half of the barley with oats did not improve the ration. A grain ration of wheat screenings and barley, equal parts, produced less finish than barley alone, but was a somewhat more economical feed. Adding linseed meal to a ration of ground barley, corn silage, and alfalfa hay increased the profits when fattening calves. Linseed meal was more satisfactory as a protein supplement than corn gluten feed. Steer calves made larger gains than heifer calves.

With 2-year-old steers a ration of whole barley, linseed meal, corn silage, and alfalfa hay was consumed in large quantities, but produced slower and more expensive gains than when ground barley was fed in place of whole barley. A grain ration of ground barley and wheat screenings was as satisfactory as barley alone when fed with linseed meal, corn silage, and alfalfa hay. The aged steers were successfully finished on barley as the only concentrate, and fairly satisfactory results were obtained when sweetclover hay was substituted for alfalfa hay. The alfalfa hay, however, was more palatable and, under similar conditions, cattle consumed larger quantities of it and made larger gains than those receiving sweetclover hay.

Palmo Midds as a partial substitute for corn for fattening calves, P. Gerlaugh (*Ohio Sta. Bimo. Bul. 145 (1930), pp. 115, 116*).—In this study 2 groups of 7 calves each, averaging approximately 438 lbs. per head, were fed a basal ration of equal parts of linseed meal and cottonseed meal, corn silage, and soybean hay for 154 days. In addition lot 1 received shelled corn, and lot 2 Palmo Midds 1 part and shelled corn 2 parts.

The average daily gains in the respective lots were 2.15 and 1.64 lbs. per head. The ration fed lot 2 was less palatable and the feed consumption lower than in lot 1. Less pork credit was obtained when Palmo Midds were fed, and the calves had a lower market valuation when this feed was given. No difference in the color or quality of the carcasses of the calves fed the two rations was apparent.

[Experiments with sheep at the North Carolina Station], E. H. Hostetler (*North Carolina Sta. Rpt. 1929, pp. 60, 61, fig. 1*).—Two experiments are briefly noted.

Upgrading of native eastern North Carolina sheep.—The average weight of sheared native ewes was 75.33 lbs., and their fleeces averaged 3.12 lbs. in weight and 2.42 in. in length. The average weight of yearling ewes out of the native ewes and sired by a Shropshire ram was 92 lbs., with a fleece averaging 6.83 lbs. in weight and 3.83 in. in length.

Comparison of temporary pastures.—In a comparison of pastures for lambs it was found that the Sudan grass was ready to graze 10 days earlier and furnished more grazing than soybeans, but lambs on the latter pasture made noticeably better gains than those on the former.

Fattening western lambs, 1928, C. Harper (*Indiana Sta. Bul. 333 (1929), pp. 16, figs. 3*).—Continuing this study (E. S. R., 63, p. 557), four lots of 25 lambs each, averaging approximately 68 lbs. per head, were fed for 80 days. All lots received cottonseed meal and corn silage; lots 1, 2, and 3 were fed shelled corn; lot 4, whole oats; lot 1 received clover hay once every fifth day; lot 2, soybean hay; and lots 3 and 4, clover hay. The average daily gains in the respective lots were 0.247, 0.289, 0.306, and 0.335 lb. per head.

The lambs fed clover hay made slightly cheaper gains, had a little more uniform finish, and returned somewhat more profit per head than those fed soybean hay. When lambs were fed clover hay every fifth day they made less rapid but more economical gains and returned less profit, but were in equally as thrifty condition throughout the experiment as the lambs full fed hay. The lambs fed oats made more rapid and economical gains, consumed 40 per cent less roughage, were slightly less uniform in finish but returned a greater profit than lambs fed corn.

Two lots of 94 and 97 lambs each, averaging approximately 63.7 lbs. per head, were turned in fields of the same size containing well matured corn, frosted roughage, and a light stand of mature soybeans that had dropped their leaves. Lot 1 received only what feed they could pick up in the field for 40 days while lot 2 received in addition 1 lb. of soybean hay per head daily. The average daily gains were 0.085 and 0.23 lb. per head in the respective lots. Feeding hay decreased death losses and increased the thriftiness of the lambs.

Lamb feeding (*Nebraska Sta. Rpt.* [*1929*], *pp. 27, 28*).—Continuing this study (E. S. R., 61, p. 859), a lot of 118 65-lb. lambs was full fed shelled corn and alfalfa hay for 84 days. At the end of this period 20 of the lambs were retained and the rest marketed. One half of the lambs retained were continued on a full feed and the others on a maintenance ration for 56 days. Another lot of 118 lambs fed alfalfa hay only for 56 days gained an average of 1.34 lbs. per head, but when full fed for 84 days on corn and hay gained 10.25 lbs. per head. The cost of 100 lbs. of gain was 7 cts. less in lot 2 than in lot 1 for the whole feeding period.

Three lambs were slaughtered from each lot at the beginning of the test and 3 others at 28-day intervals thereafter. No material difference in texture, tenderness, or juiciness of meat was found in the lambs fed as above.

Producing early lambs, W. L. Henning, P. T. Ziegler, and P. C. MacKenzie (*Pennsylvania Sta. Bul. 255* (*1930*), *pp. 19, figs. 8*).—Continuing this study (E. S. R., 57, p. 368), the results obtained during the period 1926–1930 are reported. The Dorset × Merino (first cross) ewes produced an average of 41.01 lbs. of marketable lamb, while the grade Merino ewes produced 32.45 lbs. of marketable lamb. This difference was largely due to the number of twin lambs born. The quality of the lamb carcasses produced by the crossbred ewes was higher than that of the lambs produced by the grade ewes. These lambs were marketed at from 4 to 10 weeks of age with an average of 8 weeks, and the average cold dressed weight of all carcasses was 21 lbs. During this 4-year period the average price per carcass returned to the producer was $12.

In addition to the experimental work reported, recommendations are made on the production, feeding, slaughtering, and marketing of hothouse lambs.

[**Lamb feeding studies at the Utah Station**] (*Utah Sta. Bul. 220* (*1930*), *pp. 37, 38, fig. 1*).—Two studies comparing the feeding value of the various cuttings of alfalfa hay have shown that the cuttings ranked as follows: Third, second, and first. In both studies grinding barley for lambs resulted in a loss.

In studies at Delta it was found that a ration of whole barley and alfalfa hay produced large and economical gains, that the limited use of alfalfa chaff and barley straw was unsatisfactory, that chopping alfalfa hay was unprofitable, and that feeding protein supplements was not advantageous. Lambs with heavy pelts made large gains as compared with lambs with lighter pelts.

[**Experiments with swine at the Nebraska Station**] (*Nebraska Sta. Rpt.* [*1929*], *pp. 28, 43*).—Two experiments are briefly noted.

Forage crops for hogs.—In this study 5 lots of 10 pigs each were fed on Sudan grass pasture for 90 days. The feed required to produce 100 lbs. of gain in the respective lots was 446 lbs. of corn in lot 1, 380 lbs. of corn and

26 lbs. of tankage in lot 2, 389 lbs. of ground wheat and 26.5 lbs. of tankage in lot 3, 478 lbs. of whole wheat and 32 lbs. of tankage in lot 4, and 454 lbs. of ground barley and 33 lbs. of tankage in lot 5.

Hogs [at the North Platte Substation].—Cottonseed meal in limited amounts was found to be a practical protein supplement to feed with corn, but it was indicated that the use of both tankage and cottonseed meal produced better results.

[Experiments with swine at the North Carolina Station], E. H. Hostetler (*North Carolina Sta. Rpt. 1929, pp. 61–66, 72, 73, figs. 2*).—The results of experiments in continuation of those previously reported (E. S. R., 61, p. 762) are noted.

Mineral supplements.—A ration of shelled corn and fish meal was self-fed to 4 lots of 15 pigs each, averaging 56 lbs. per head, for 98 days. In addition a mineral supplement was added in lots 2, 3, and 4. The mixture used in lots 2 and 3 consisted of 10 lbs. of ground limestone (dolomitic lime in lot 2 and calcitic lime in lot 3), 10 lbs. of superphosphate, and 2 lbs. of salt. Lot 4 received a commercial mineral mixture. The average daily gains in the respective lots were 1.06, 1.13, 1.13, and 1.09 lbs. per head, and the feed consumed per 100 lbs. of gain was 405, 412, 423, and 432 lbs., respectively.

Fish meal v. *whale meal*.—Fish meal was found to contain 55 per cent of protein as compared with 49.94 per cent for whale meal. When used as a supplement to corn, fish meal produced faster gains and was apparently more palatable than whale meal. Pigs receiving fish meal averaged 117 lbs. per head after 56 days on this feed, while those receiving whale meal averaged only 81 lbs.

Cottonseed meal for fattening pigs.—In this study 2 lots of 12 pigs each, averaging 71 lbs. per head, were self-fed shelled corn for 70 days. In addition, lot 1 received a protein supplement of fish meal and cottonseed meal, 1:2, and minerals, while lot 2 received fish meal only. The average daily gains were 1.47 and 1.35 lbs. per head in the respective lots. Lot 1 required 380 and lot 2 371 lbs. of feed for each 100 lbs. of gain. The ration containing cottonseed meal was more palatable and profitable than that containing fish meal only.

A study of factors causing lameness and death among pigs.—In an effort to determine the cause of lameness in fall-farrowed pigs, 4 lots of 15 pigs each, averaging 93 lbs. per head, were fed in floored pens for 76 days. Each lot received shelled corn, fish meal, and minerals. White corn was fed except in lot 2, which received yellow corn. One part of ground soybean hay was fed for each 3 lbs. of fish meal in lot 3, and 1 part of alfalfa meal for each 3 lbs. of fish meal in lot 4. In lot 1 8 pigs developed some lameness, but none appeared in any of the other lots. Lot 2 made the most rapid and economical gains and returned a greater profit over the feed cost than any of the other lots.

Value of permanent pasture for fattening pigs.—To determine the value of permanent pasture, 3 lots of 20 pigs each, averaging 51 lbs. per head, were fed. Lot 1 was fed in dry lot, but lots 2 and 3 were allowed 0.5 acre of orchard grass pasture each. A ration of corn meal, wheat shorts, fish meal, and mineral was fed in lots 1 and 2, and in lot 3 the protein feeds were limited to one-half that included in the ration of the other two lots. The average daily gains were 1.42, 1.66, and 1.61 lbs. per head in the respective lots, and the profit per pig over feed cost was greatest in lot 2, with only a very slight difference in the profits returned by lots 1 and 3.

A study of the utilization of crops.—In this study 2 acres of rye at the Upper Coastal Plain Substation furnished grazing for 16 69-lb. pigs for 92 days. In addition to the pasture, the pigs consumed 9,931 lbs. of grain and 157 lbs. of mineral.

Soft pork.—In this study made in cooperation with J. O. Halverson, peanuts were again used as the chief constituent of a softening ration fed to two groups of pigs, one of which weighed from 35 to 40 lbs. and the other approximately 65 lbs. initial weight. Each pig was allowed to gain from 40 to 50 lbs. in lot 1 and from 35 to 40 lbs. in lot 2 before being changed to the hardening ration of corn and cottonseed meal, 6:1. In all, 24 pigs were fed.

Both groups produced satisfactory carcasses with the exception of one pig, which was graded medium soft. On the hardening ration some of the pigs consumed an average of 1 lb. of cottonseed meal daily for 68 days and made average daily gains of from 1.76 to 2.1 lbs. per head.

The 3-year averages of the fat constants (back fat) for both 35- and 60-lb. pigs fed peanuts followed by corn alone were for melting point 37.6° C., iodine absorption number 65.7, and refractive index 1.4601, and for pigs fed a hardening ration of corn plus 12.4 per cent of cottonseed meal, 44.2°, 61.6, and 1.4596, respectively. Similar results were obtained with internal or kidney fat.

Pasture crops for swine, M. A. McCarty and M. F. Grimes (*Pennsylvania Sta. Bul. 254 (1930), pp. 12, figs. 4*).—The results of four studies are noted.

A comparison of rape, Sudan grass, and alfalfa forage.—In this study 3 lots of 8 pigs each, averaging approximately 82 lbs. per head, were fed a basal ration of shelled corn, middlings, tankage, and minerals at the rate of 3 lbs. per 100 lbs. of live weight for 56 days. The respective lots had access to 0.25-acre plats of Dwarf Essex rape, Sudan grass, and alfalfa. The average daily gains were 1.13, 1.1, and 1.14 lbs. per head in the respective lots. The feed required per 100 lbs. of gain was highest in lot 1 and lowest in lot 3, but the difference was not great. On the basis of rate of gain, feed required per unit of gain, and feed cost per unit of gain, the pasture crops ranked in the following order: Alfalfa, Sudan grass, and rape.

A comparison of oats and field peas, rape, alfalfa, and Sudan grass forage.—The results of this test have been previously noted (E. S. R., 56, p. 165).

A comparison of rape, alfalfa, and Sudan grass.—The results of this test have been essentially noted (E. S. R., 58, p. 359).

A comparison of bluegrass, rape, rape and oats, and Sudan grass.—A basal ration of ear corn, middlings, tankage, and skim milk was fed to 5 lots of 22, 20, 22, 20, and 22 pigs, averaging approximately 55 lbs. per head, for a period of 56 days. The respective lots were placed on 1-acre plats of bluegrass, Dwarf Essex rape, Dwarf Essex rape, Dwarf Essex rape and oats, and Sudan grass. The average daily gains were 0.59, 0.67, 0.58, 0.56, and 0.48 lb. per head in the respective lots. On the basis of feed required per unit of gain and on feed cost per unit of gain the lots ranked as follows: 2, 4, 3, 1, and 5.

On the basis of these four studies it is concluded that alfalfa and rape are the best pasture crops for swine, being very nearly equal in value. Adding oats to a planting of rape did not make as satisfactory pasture as rape alone. Sudan grass was not suitable for young growing pigs and was utilized to better advantage by larger pigs. Oats and peas were available for only a short period, and bluegrass was valuable only in early spring and late fall.

Oats with vetch or Austrian peas as grazing crops for fattening hogs, J. C. Grimes, W. E. Sewell, and W. C. Taylor (*Alabama Sta. Bul. 233 (1930), pp. 14*).—The results of four experiments, the first two of which have been previously noted (E. S. R., 60, p. 170), are reported in this publication.

In the third experiment 3 lots of 10 pigs each, averaging approximately 102 lbs. per head, were fed for 56 days. Lot 1 was self-fed corn, tankage, and minerals on oats and Austrian pea pasture; lot 2 received corn and tankage 12:1 hand-fed at the rate of 3 per cent of the live weight and minerals self-fed on the same pasture; while lot 3 was self-fed corn, tankage, and minerals in dry lot. The average daily gains in the respective lots were 1.96, 1.58, and 1.84 lbs. per head. The feed required and the cost of feed per 100 lbs. of gain were highest in lot 3 and lowest in lot 2. The oat and pea pasture in this study saved 24.12 lbs. of concentrates per 100 lbs, of gain when the corn and tankage were self-fed and 126.68 lbs. of feed when they were limited-fed.

The plan of the fourth experiment, the pasturage used, and the manner of feeding were the same as in the third test. In this study 3 lots of 10, 9, and 10 head each, averaging approximately 51 lbs. per head, were fed for 84 days. The average daily gains were 1.65, 1.06, and 1.59 lbs. per head in the respective lots. Again the feed required and the cost of feed per 100 lbs. of gain were highest in lot 3 and lowest in lot 2. When the corn and tankage were self-fed the pasture saved 23.15 lbs. of concentrates per 100 lbs. of gain, and when limited-fed 146.33 lbs. of feed.

On the basis of the four experiments it was found that the pigs self-fed corn and tankage on either oat and vetch or oat and Austrian pea pasture made an average daily gain of 0.26 lb. more than those similarly fed in dry lot and required 58.75 lbs. less concentrates per 100 lbs. of gain. The self-fed pasture pigs also made 0.43 lb. larger daily gains than the limited-fed pasture pigs. However, the latter pigs required on the average 62.4 lbs. less feed per 100 lbs. of gain than the former. The pigs that were limited-fed on pasture required 121.15 lbs. less feed to produce 100 lbs. of gain than those self-fed in dry lot. On the basis of 10 pigs to the acre, the average apparent value of 1 acre of pasture was $20.80 when the concentrates were self-fed and $21.60 when the concentrates were limited-fed.

Fiber in rations for growing and fattening pigs, W. L. Robison (*Ohio Sta. Bimo. Bul. 145 (1930), pp. 102–107*).—Several experiments have been conducted to furnish information concerning the effect of fiber in rations for growing and fattening pigs. In the first of these tests 2 lots of 5 pigs each, averaging approximately 62 lbs. per head, were fed the same basal ration containing less than 1 per cent of fiber. Lot 1 had sufficient peanut hulls added to bring the fiber content to 5.8 per cent, and lot 2 enough to bring the fiber content to 12.1 per cent. The average daily gains were 1.27 and 1.08 lbs. per head in the respective lots. Lot 2 required approximately 16 per cent more feed per unit of gain than lot 1.

In a second test 5 lots of 4 pigs each, averaging approximately 47 lbs. per head, were fed a basal ration containing approximately 0.75 per cent of fiber to which was added for lots 2 to 5 enough peanut hulls to bring the fiber content of the respective rations to 3, 6, 9, and 12 per cent. The average daily gains in the respective lots were 1.53, 1.43, 1.25, 1.22, and 1.26 lbs. per head. With the exception of lot 5, each increase in the percentage of fiber decreased the rate of gain and increased the feed required per unit of gain.

To study the effect of hulled oats 3 lots of 5 pigs and 1 lot of 4 pigs each, averaging approximately 47 lbs. per head, were fed the following rations: Lot 1, hulled oats and tankage 12:1; lots 2 and 3, the same as lot 1 except that 10.8 and 22 per cent of ground oat hulls, respectively, were added; and lot 4, ground oats and tankage 12:1. The average daily gains in the respective lots were 1.24, 1.05, 1, and 1.06 lbs. per head. With the exception of lot 4, each increase in percentage of fiber decreased the rate of gain and increased the feed required per unit of gain. When the pigs receiving hulled oats averaged about 175 lbs. in weight some of them became stiff or lame and either lost weight or gained very slowly. That this lameness was due to a lack of minerals and vitamins was shown by the fact that cod-liver oil cured the lameness, and the addition of 3 per cent of ground alfalfa prevented the development of the lameness.

A summary of three tests in which hulled and unhulled oats were compared showed that pigs receiving hulled oats gained at the rate of 1.25 lbs. per head daily, while those receiving unhulled oats made an average daily gain of 0.95 lb. per head. The feed required to produce a unit of gain was very much higher in the lots receiving unhulled oats than in those receiving hulled oats.

Alfalfa hay and alfalfa leaves as supplements in dry lot rations for finishing fall pigs, J. E. Norby (*Idaho Sta. Circ. 56 (1929), pp. 3, fig. 1*).—The results reported in this circular have been essentially noted (E. S. R., 63, p. 558).

Wheat supplemented with tankage in limited and full grain rations on alfalfa forage, J. E. Nordby (*Idaho Sta. Circ. 57 (1929), pp. 2*).—This is a more detailed account of work previously noted (E. S. R., 63, p. 558).

Wheat and wheat by-products in swine production, J. E. Nordby (*Idaho Sta. Circ. 55 (1929), pp. 4*).—The value of wheat and its by-products as feeds for swine is discussed in this publication.

Potassium iodide as a mineral supplement in paired feeding experiments with growing swine, W. E. Carroll, H. H. Mitchell, and G. E. Hunt (*Jour. Agr. Research* [*U. S.*], *41 (1930), No. 1, pp. 65–77*).—At the Illinois Experiment Station a critical analysis was made of the published experiments dealing with the effect of supplemental iodides on the growth of animals not apparently suffering from hypothyroidism. The analysis showed that the majority of the experiments indicated no beneficial effects, and that in the case of experiments which had been interpreted in a positive manner they were either statistically inadequate or demonstrably misinterpreted.

A paired-feeding experiment was conducted in which 13 pairs of Poland China pigs that were carefully selected for equality of weight, sex, breeding, and condition were fed from an initial weight of 57 to 76 lbs. to an approximate final weight of 175 lbs. on a basal ration of ground yellow corn, tankage, linseed meal, alfalfa meal, and salt. The test pig of each pair had a water solution containing the equivalent of 1 grain of elemental iodine poured over the morning feed each day. There was no significant difference in the rate of growth of the animals in any pair, and 7 of the 13 control pigs made somewhat more rapid gains than the test pigs of the pairs.

Influence of small quantities of potassium iodide on the assimilation of nitrogen, phosphorus, and calcium in the growing pig, F. J. McClure and H. H. Mitchell (*Jour. Agr. Research* [*U. S.*], *41 (1930), No. 1, pp. 79–87*).—Metabolism studies were conducted at the Illinois Experiment Station with 5 pigs fed 0.248 gm. of postassium iodide daily for 14 days. The experimental period was preceded and followed by 14-day control periods. The results showed no evidence that the utilization of either nitrogen, calcium, or phosphorus was favorably affected, but there were indications that the retention of calcium was adversely affected. The rate of growth of the pigs was apparently not affected by the iodide feeding.

Cost of raising pigs to weaning age, E. H. Hostetler, R. E. Nance, and J. E. Foster (*North Carolina Sta. Bul. 272 (1930), pp. 12, figs. 3*).—Experiments to determine the cost of pigs at weaning age and the relation and extent of relation between the various factors entering into pig production were carried on at the Piedmont Substation for 3 years, at the State College Farm for 1.5 years, at the Upper Coastal Plain and Blackland Substations for 4 years, and at the Swine Research Farm for 5 years (E. S. R., 47, p. 777). Except during the early part of the work, when high-grade sows were used at the Blackland Substation, purebred Poland Chinas were used at the Piedmont, Blackland, and Swine Research farms, Berkshires at the college farm, Hampshires at the Upper Coastal Plain Substation, and Duroc-Jerseys at the Swine Research Farm. The sows were bred to farrow in the spring and fall, and an attempt was made to utilize as much pasture as was possible and practical. However, since the pasture conditions were not the same at all farms the cost was not included in the cost of producing pigs. Records were kept of the kinds and amounts of feed fed daily; kind of pasture grazed; date of farrowing, breeding, and weaning; cost of maintaining the boar; the number, sex, and weight of the pigs when farrowed and weaned; and the time devoted to the care of the sow and her pigs, together with notes in cases of sickness and death.

The average weaned weight and the average cost per pig per pound decreased as the number of pigs per litter increased. More pigs per litter were raised at a low cost in fall than in spring litters; however, the spring pigs were heavier at weaning time. Sows that lost weight during the suckling period weaned larger litters of heavier pigs at a lower cost than sows that gained in weight during this period. As sows grew older they farrowed larger litters and weaned more pigs than they did from their first litter. The size and weight of the litter at weaning time was but little influenced by the weight of the sow at farrowing time, but on the average the weight and cost per pig was larger for the heavier sows. The size of the litter at farrowing time is no criterion of the size at weaning time.

When feed, labor, and boar service were included in the cost of production, the average pig cost $5.17 at 8 weeks of age, and $3.72 when only the cost of feed was charged against production.

[Experiments with poultry at the Nebraska Station] (*Nebraska Sta. Rpt. [1929], pp. 38, 39, 47*).—Experiments in continuation of those previously reported (E. S. R., 61, p. 861) are noted.

Nutrient requirements of growing chicks.—A ration complete in all nutritive essentials which was autoclaved at 15 lbs. pressure for two hours produced no growth with chicks, and the birds showed typical symptoms of antineuritic deficiencies. A similar ration autoclaved for one hour produced some growth but at a much slower rate than in the control lot.

Chicks fed a ration in which cod-liver oil had been mixed for one month or more did not make as rapid growth as those receiving a ration containing the same grade and amount of oil that was mixed and fed while fresh. When the cod-liver oil was mixed with a ration complete for vitamin A, the freshly mixed oil produced better growth than that which had been mixed and stored for some time. While these results indicate the advantage of using freshly mixed cod-liver oil, it was observed that both vitamins A and D were relatively stable when mixed with other ingredients and stored at ordinary temperatures.

Turkey production.—Turkeys that had artificial light from 6 o'clock in the morning until daybreak, beginning February 1, began to lay about one month earlier than those receiving the same ration but no lights. More difficulty was experienced in trap nesting turkeys than chickens. As with chickens, the younger laying females were better layers than the two-year-olds. Under similar conditions the egg production of individual turkey hens varied from 9 to 58 eggs. Green alfalfa was found to be of great value to growing turkeys even when fed yellow corn.

Poultry [at the Valentine Substation].—Turkey hens at this substation averaged 46 eggs up to the first of June, with a fertility of 94 per cent and a hatchability varying from 50 to 85 per cent with from 2 to 5 per cent cripples. The feed cost per poult was $1.27.

[Experiments with poultry at the North Carolina Station] (*North Carolina Sta. Rpt. 1929, pp. 105–113*).—The results of several experiments are noted (E. S. R., 61, p. 764).

The cost of putting pullets into lay, B. F. Kaupp (pp. 105–110).—During 1929 four more tests were run in this study to determine the feed consumption and feed cost of putting Single Comb Rhode Island Red pullets into lay. When meat meal was used as the sole source of animal protein, the total feed consumption was 22.82 lbs. per pullet, of which 13.51 lbs. was mash and 9.31 lbs. grain. The cost of feed was 66 cts. per bird. When milk constituted the sole source of animal feed, each pullet consumed 23.3 lbs. of feed, of which 10.02 lbs. was mash, 8.81 lbs. grain, and 4.47 lbs. milk, at a cost of 71 cts. per bird.

Crate fattening broilers, B. F. Kaupp (p. 110).—When milk was used as the sole source of animal protein for crate feeding broilers, the birds made slightly better gains at a somewhat lower feed cost per pound of gain than when meat meal was used as the sole source of animal protein. It was noted that during hot weather the chicks on a milk ration went off feed faster than those on a meat meal ration.

Commercial fall broiler production, B. F. Kaupp (p. 111).—This study was made to determine the cost of producing broilers hatched during the fall and winter, and the various items of expense, together with the mash formula used, are included.

Farm flock management, B. F. Kaupp (p. 112).—Continuing this study at the Coastal Plain Substation, the flock of Rhode Island Reds receiving meat meal as the sole source of animal protein averaged 116 birds during the year. The average production in this flock was 136 eggs per bird per year, and the feed cost per dozen eggs was 21 cts. The flock receiving milk averaged 102 birds, which had an average egg production of 130 eggs per bird per year at a feed cost of 34 cts. per dozen.

Hatchery experiments, W. F. Armstrong (pp. 112, 113).—The results of one year's study to determine the hatchability of eggs according to the interior quality showed that while the dark-yolk eggs had 5 per cent better fertility and 1 per cent less mortality of embryos, they did not hatch any better than other eggs. Of the fertile eggs set, the light-yolk eggs had about a 5 per cent better hatch than the dark-yolk eggs. There were indications that blood spots did *not* affect hatchability. No eggs with dislocated air cells or with watery albumin hatched.

[Poultry feeding at the Utah Station] (*Utah Sta. Bul. 220 (1930), p. 33*).—Continuing this study (E. S. R., 61, p. 63), no particular advantage was noted from feeding cod-liver oil at the rate of 1.5 per cent in the mash as compared with keeping well-cured alfalfa leaves before the birds at all times. On the basis of egg production and reduced mortality, a slight advantage was noted for supplying both cod-liver oil and the alfalfa leaves.

Hopper-feeding grain, T. B. CHARLES and H. O. STUART (*New Hampshire Sta. Circ. 33 (1930), pp. 7*).—To determine the advisability of feeding grain in troughs or hoppers, four pens containing a total of 478 mature Rhode Island Reds were fed for 37 weeks on the same scratch and mash mixtures. All pens were housed under identical conditions. The first two pens had grain available in hoppers at all times, while the last two pens had grain in hoppers for a period of approximately one hour before the time the birds went to roost.

These birds consumed on the average slightly more than 1.5 lbs. of feed per week and apparently were able to adjust their feed intake regardless of the manner in which the grain was fed. Approximately 48 per cent of the total feed consumed was mash, but weekly variations in the proportion of mash to scratch feed ranged from 39 to 65 per cent, indicating that rate of production and environmental conditions influenced the body needs. All the birds gained consistently in weight and were in excellent market condition at the close of the experiment.

The value of potassium iodide as a supplement to the ration of growing chicks, T. S. HAMILTON and C. H. KICK (*Jour. Agr. Research [U. S.], 41 (1930), No. 2, pp. 135–137*).—This contribution from the Illinois Experiment Station is a more detailed account of work previously noted (E. S. R., 60, p. 260).

Duration of annual molt in relation to egg production, F. A. HAYS and R. SANBORN (*Massachusetts Sta. Bul. 264 (1930), pp. 71–85*).—A study was made of such conditions as environmental factors, hereditary characteristics, and physiological activities which may influence the duration of molt and the relation of duration of molt to vigor and to second-year production, using 936 Rhode Island Red hens hatched between 1917 and 1928 and kept for two full laying years.

It was found that hatching date did not affect the duration of complete molt, and that age at first egg was not significantly correlated with length of molt. Intensity and persistency showed negative correlations of 0.3339 and —0.3613, respectively, with duration of molt. The length of winter pause, total days broody in the pullet year, and gain in body weight during the pullet laying year were independent of length of molt. There was no relationship between the duration of molt and weight at first egg. Negative correlations of 0.3695 and 0.3592, respectively, were found for egg production previous to molt and number of eggs laid in 365 days by pullets. Vigor did not affect the duration of molt. A negative correlation of −0.296 was found between length of molt and second-year egg production. In general the highly intense and persistent layers had the shortest molt period, indicating that the physiological activities of molting and feather growth progress rapidly in the heavy layers.

Rules and regulations for the seventh Utah intermountain egg-laying contest, B. ALDER (*Utah Sta. Circ. 89 (1930), pp. 4, fig. 1*).—General information and rules for the seventh Utah intermountain egg-laying contest (E. S. R., 61, p. 764).

Poultry farm routine, J. C. TAYLOR (*New Jersey Stas. Hints to Poultrymen, 18 (1930), No. 9, pp. 4*).—In this publication the author discusses the efficient organization of the routine labor of a poultry farm.

The poultry industry of the United States of America (*U. S. Dept. Agr., 1930, pp. IV+74, figs. 58*).—This booklet, published as a supplement to the exhibit of the U. S. Department of Agriculture at the Fourth World's Poultry Congress, presents facts regarding the production, marketing, and uses of poultry and their products in the country.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the North Carolina Station], C. D. GRINNELLS (*North Carolina Sta. Rpt. 1929, pp. 69, 71*).—Two studies are noted.

Corn silage v. sorghum silage.—Using the double reversal method, 2 groups of cows were fed the same basal grain and hay ration for a total of 120 days. During one experimental period, one group of cows received corn silage and the other group sorghum silage. The feed consumed per 100 lbs. of milk produced while receiving corn silage was hay 54 lbs., silage 135 lbs., and grain 18.1 lbs., and while receiving sorghum silage, hay 60 lbs., silage 150 lbs., and grain 20 lbs. The feed consumed per pound of butterfat produced while receiving corn silage was hay 20.54 lbs., silage 51.3 lbs., and grain 7.24 lbs., and while receiving sorghum silage, hay 21.7 lbs., silage 54.31 lbs., and grain 7.24 lbs.

Shocked sorghum v. corn silage.—In this study the feed consumed per pound of butterfat produced while receiving corn silage was grain 9.1 lbs., hay 8 lbs., and silage 26 lbs. When shocked sorghum was substituted for the corn silage the feed required to produce a pound of butterfat was grain 10.2 lbs., hay 6.4 lbs., and sorghum 32 lbs. The shocked sorghum was not palatable and large amounts were refused by the cows.

Dairying at the Ohio Agricultural Experiment Station (*Ohio Sta. Spec. Circ. 29 (1930), pp. 40, figs. 16*).—In addition to considerable data previously reported, the results of several experiments are briefly noted.

Cost of feeding the bull.—Based on 29 yearly records for Jersey bulls and 22 yearly records for Holstein bulls, it was found to cost $80.27 and $101.71, respectively, for feed for each animal per year.

Comparison of varieties of corn for silage.—In cooperation with the department of agronomy a study was made of the yield and analysis of 10 leading varieties of corn for silage. When all factors were considered, the varieties Leaming, Clarage, and Sweepstakes were most suitable under the conditions in which they were grown.

Silage v. wet beet pulp-molasses mixture.—To compare some of the physiological reactions resulting from silage rations with those from nonacid rations, 16 cows divided into groups were fed varying rations containing either silage or wet beet pulp mixed with molasses. There were no striking or constant differences in the bicarbonate, acid, or ammonia content of the urine of the cows while on the two succulent feeds. There was usually about 5 per cent more milk and butterfat produced when the cows received the wet beet pulp-molasses mixture than when they received corn silage. Under ordinary conditions, however, beet pulp, due to its higher cost, is not considered an economical substitute for silage.

[*Effect of iodized milk on growth of calves*].—In this study two groups of calves received the same basal ration, but one group received normal milk while the other group received iodized milk. Over a 5 months period the eight calves receiving normal milk made an average daily gain of 1.58 lbs. per head, while those receiving iodized milk gained 1.7 lbs. per head daily. The latter group also looked better physically and had a little better finish, as evidenced by the condition of the hair and skin than did those receiving normal milk.

A study of the accuracy of measurements of dairy cattle, J. L. Lush and O. C. Copeland (*Jour. Agr. Research* [*U. S.*], *41 (1930), No. 1, pp. 37–49, figs. 9*).—In this study at the Texas Experiment Station, 9 cows and 10 heifers of purebred or high-grade Jerseys were each measured 11 times. Twenty-five different measurements were studied in an effort to determine the extent of error normally encountered in taking measurements. The usual error of measuring was calculated for each measurement of the cows and of the heifers.

The two sets of data were found to agree quite closely, although somewhat larger errors were found for the cows than for the heifers. In about one-third of the measurements the standard error was less than 1 per cent, and in only a few cases was it greater than 2 per cent. These errors were of about the same magnitude as the errors of weighing (E. S. R., 59, p. 563) when expressed as percentages of the mean.

A slight correlation existed between the mean size of a measurement for each animal and the standard deviation of the measurements taken on that animal. This correlation varied for different measurements, and in some cases would have been large if the data for the cows and heifers had been included in a single population.

Irrigated pastures for dairy cattle, I. R. Jones and P. M. Brandt (*Oregon Sta. Bul. 264 (1930), pp. 30, figs. 13*).—In an effort to obtain information on the value of irrigated pasture for dairy cows, a field of Ladino clover was divided into 3 plats of 3.61, 3.67, and 3.99 acres each. Cows were rotated from one pasture to another and as they left one plat of land it was irrigated. In 1928 pasturing began on August 20 and continued to October 24, furnishing feed for an average of 34 cows for 66 days, making a total of 2,244 cow days. It was estimated that the pasture saved $335.14 worth of feed besides producing 15 tons of hay worth $150. The total pasture cost for this year was $174.94, leaving a net return of $27.57 per acre.

During the 1929 season the pasture was used from May 9 to October 17, except for a 16-day period from July 20 to August 5. For this season the pasture furnished feed for a total of 7,032 cow days, an average of 3.74 cows per acre for the 6-months pasture season. It was estimated that the cows received from the pasture feed equivalent to 17 lbs. of alfalfa hay or 10 lbs. of alfalfa hay and 19.34 lbs. of corn silage per head per day. The total feed saved was worth $827.60, and the cost of the pasture was $308.85, leaving a net return of $46.11 per acre.

The Ladino clover grew luxuriantly on poor soil under irrigated conditions, but because of its shallow root system required a large amount of water. The stand was thicker at the end of the 1929 season than at the end of the previous season, showing that heavy grazing had no effect on the stand. No account was taken in this study of the value of the clover as a succulent, of its high percentage of protein, or of its high mineral and vitamin content. The milk production of the cows on the irrigated pasture did not decline as rapidly during July, August, and September as it did under average conditions. Some difficulties were experienced with cows bloating on this pasture.

Dicalcium phosphate as a mineral supplement for dairy cows.—II, Effect on milk production, C. C. HAYDEN, C. F. MONROE, and C. H. CRAWFORD (*Ohio Sta. Bimo. Bul. 145* (*1930*), *pp. 108–110*).—Continuing this study (E. S. R., 63, p. 368), the average daily milk and fat production of a group of heifers receiving dicalcium phosphate was 30.54 and 1.039 lbs. and for the group receiving no added minerals 29.73 and 1.026 lbs., respectively. When a comparison was made of the first 7 months of each full lactation period and corrections were made for age and quality of milk, the daily production for the mineral-fed group was 37.3 lbs. of milk and for the nonmineral-fed group 39.8 lbs. During the second lactation the mineral-fed heifers increased their production 27.9 per cent over the first lactation, while the nonmineral-fed heifers increased their production 30.8 per cent. None of the differences noted were significant.

Studies of "fat soluble A" as present in the milk of the four dairy breeds, Holstein, Ayrshire, Jersey, and Guernsey (*Nebraska Sta. Rpt.* [*1929*], *pp. 12, 13*).—Continuing this study (E. S. R., 55, p. 675), Holstein milk containing 3.5 per cent butterfat produced superior gains with rats, but no differences in gains were obtained with Holstein and Jersey milk when it was necessary to standardize both to 3.5 per cent. Rats fed standardized Holstein milk made greater average gains than those receiving standardized Ayrshire milk. A test of the skim milk used in standardizing indicated that it contained little if any vitamin A.

The limits of error of the Babcock test for cream, W. H. MARTIN, A. C. FAY, and K. M. RENNER (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 2, pp. 147–159*).—A series of experiments were conducted at the Kansas Experiment Station to measure the limits of error of the Babcock test for cream. In one series a large number of tests were made on one can of sweet cream, in another on cream before and after souring, in another samples were sent to three laboratories for analysis, and in another case samples were sent to one of these laboratories in such a way as to prevent the operator from knowing he was testing checked samples. In the first two series both experienced and inexperienced operators read the tests.

Of the 456 readings in the first series the practical limits of variation were 0.444 per cent, and in the second series the limits of 1,599 readings were 0.413 per cent on sweet cream and 0.443 per cent on sour cream. The extent of the errors depended to some extent on the experience of the reader. However, precise work was found to be more important than experience. Cream samples which had been weighed into 9-gm. test bottles and reweighed on analytical balances were found to check quite closely, the error due to weighing being responsible for only about 20 per cent of the total variation. In the series of tests in which samples were submitted to laboratories, it was found that the error of routine testing was much greater when the operator was unaware that his readings were being checked.

On the basis of these studies it was found that a technician could not be certain that single tests on 37 and 40 per cent cream would be closer than ± 0.44 to ± 0.55 per cent fat, or that the average of duplicate tests would be closer than ± 0.31 to ± 0.39 per cent fat.

Factors affecting the heat coagulation of homogenized coffee cream, P. H. Tracy and H. A. Ruehe (*Illinois Sta. Bul. 352* [*1930*], *pp. 567–578*).—Continuing the study of cream feathering (E. S. R., 59, p. 875), an experiment was planned to study the effect of such variables as the mineral content of the water used in making coffee, the salt balance of the cream serum, the temperature to which the cream is heated before homogenization, the temperature and pressure of homogenization, the use of the two-stage homogenizer, and the fat and serum solids content of the cream. Each factor was studied separately to determine its effect on the amount of feathering, using 9-gm. samples of cream and 100 cc. of water with an approximate temperature of 205° F., mixed in a teacup.

The factors affecting the feathering of fresh cream in coffee were found to be the presence of soluble calcium salts in the water used or an excess of such salts in the cream, preheating to temperatures less than 175°, increasing the ratio of fat to serum solids in the cream, increasing the surface area of the fat by increasing the homogenizing pressures, using single instead of two-stage homogenizers or an improper combination of pressures on the two-stage machine, and increasing viscosity of the cream by homogenizing at low temperatures.

Recommendations for the control of feathering of fresh cream in coffee are presented.

How to whip cream, J. C. Hening (*New York State Sta. Circ. 115* (*1930*), *pp. 5, figs. 4*).—In this publication the author discusses the factors to be observed in whipping cream in order to obtain the most desirable product.

Some of the factors influencing the growth of molds in butter, H. Macy (*Minnesota Sta. Tech. Bul. 64* (*1929*), *pp. 86, pls. 4*).—The following species of molds *Alternaria humicola, Aspergillus flavus, A. niger, Hormodendrum cladosporioides, Mucor sylvaticus, Oospora lactis A, O. lactis B, Penicillium biforme, P. expansum,* and *Rhizopus nigricans* were isolated from butter and a study made of the influence of food supply, moisture, atmosphere, temperature, and salt concentration on the growth of these molds.

Purified fat in the absence of water was not readily utilized as food and, even when water was present, produced only moderate growth. Lecithin and the hydrolytic products of fat, glycerol, palmitic and oleic acids, were fairly satisfactory foods.

A. humicola made slight growth on media having stearic acid as the only source of food, but no growth occurred on a 1 per cent solution of butyric acid. Such nitrogen-containing compounds as peptone, curd from butter, and serum from cream were excellent sources of food, but lactose and lactic acid in 1 per cent solutions were not very satisfactory. Solutions made of milk ash unless neutralized were not readily utilized, and combinations of fat, lecithin, and water; fat and ash; fat, ash, and water; and lactose and peptone produced better growth than that obtained on any single substance. The molds grew extensively on the surfaces of media containing nitrogen compounds, but the growth on the substrata containing fats, fatty acids, glycerol, lactose, or lactic acid was largely below the surface of the medium. Unsalted butter containing fat, protein, carbohydrate, and ash supported active growth.

Humidity, especially when the surface of the butter was contaminated, had a marked influence on the growth of molds, growth being checked at low humidities. When molds were actively growing in cream before the butter was made, humidity had a less pronounced effect on growth.

Temperature also had a marked effect upon the growth in various substrata. Growth of all species was active at from 20 to 25° C. At 10° or lower growth of *A. flavus* was checked, and at 0° *A. niger* and *R. nigricans* were checked. At 0° *M. sylvaticus* grew in whey media and buttermilk, but not in butter. The other species were able to grow at 0°, but the growth was not as rapid or extensive as at higher temperatures. Time was also an influencing factor at low temperatures. At from 20 to 25° all species were able to grow when under a vacuum of 25 in. and removing part of the carbon dioxide did not prevent growth, but when the oxygen was exhausted none of the species were able to develop.

When the salt concentration exceeded 5 per cent, the growth of *O. lactis*, *M. sylvaticus*, and *R. nigricans* was inhibited. Such species as *A. humicola*, *A. flavus*, *A. niger*, *H. cladosporioides*, *P. biforme*, and *P. expansum* were able to grow in media containing 15 per cent of salt, and in some cases the species of Penicillium showed some growth when the salt content ran as high as 20 per cent. The species of mold and the temperature of incubation affected the extent to which salt inhibited growth.

Under favorable conditions all the species studied grew on butter. *A. humicola* and *H. cladosporioides* had the most harmful effect on the appearance of the butter, while the other species seriously affected the flavor and odor.

From these data it is evident that the species of mold, the humidity, the oxygen supply, the temperature of storage, time, and salt concentration affect the growth of molds in butter, and that these factors may act independently or collectively.

[The effect of physical curd on cheese] (*Utah Sta. Bul. 220 (1930), p. 45, fig. 1*).—Milk from cows testing hard and soft curd was standardized to the same fat content and then made into cheese. The hard-curded milk required about an hour's time less in the setting process, and the texture and quality of the cheese made from this milk was superior to that made from the soft-curded milk. Preliminary studies indicate that the hard-curded milk is worth 38 cts. more per 100 lbs. for cheese making than the soft-curded milk.

VETERINARY MEDICINE

[Work in animal pathology at the Florida Station], A. L. SHEALY (*Florida Sta. Rpt. 1929, pp. 40–42*).—Continuing previous work (E. S. R., 62, p. 374), the study of the life history of the kidney worm of swine indicated that cultures of the eggs would hatch in the laboratory both in the incubator and at room temperature. Hatching took place more rapidly when the eggs were kept in a moist temperature in the incubator and was also facilitated by keeping the cultures stirred to allow aeration. In this way the eggs were induced to hatch in less than 24 hours. Experimental animals were infested by administering the larvae through the mouth and also through the nostrils, large numbers of the larvae being recovered from the liver of such animals. No infestation took place where the larvae were placed on the intact skin.

In further studies of paralysis of the domestic fowl, the disease was not produced through the feeding of healthy birds with the intestinal contents and scrapings of the intestinal walls from a paralyzed chicken. Neither did the brain from paralyzed birds produce paralysis when fed to healthy fowls. In experiments conducted on a near-by poultry farm there was no transmission of the disease from the hen through the egg to the offspring. Neither did paralysis seem to have any relation to coccidiosis, since there had been a severe outbreak of this infection among the chicks. Several birds that were injected from time to time during the year with various tissues of paralyzed birds failed to develop the disease.

[Work with diseases of livestock at the Nebraska Station] (*Nebraska Sta. Rpt. [1929], pp. 10, 14*).—A preliminary account is given of the progress of an investigation of the part played by the avian tubercle bacillus in the production of tuberculosis of farm animals, with the exception of swine and poultry, the details being presented in tabular form.

Reference is also made to an attempt to free a dairy herd from infectious abortion through the application of the agglutination test and isolation of reacting animals. A separate group of buildings and yards was provided for the animals considered infected. The negative herd is tested each month and the entire herd every three months. Studies of the monetary loss of milk, calves, etc., in the herd due to infectious abortion which have been completed were found in 33 years to have amounted to more than $20,000.

[Work in animal pathology at the Utah Station] (*Utah Sta. Bul. 220 (1930), pp. 35, 36*).—It is reported that where botulism among animals occurred in the State the botulinus antitoxin was used with fairly satisfactory results. This antitoxin is being recommended where animals show symptoms of the disease formerly known as forage poisoning.

Lunger disease among sheep, still under investigation (E. S. R., 61, p. 69), was not transmitted from affected to healthy sheep either by contact or by inoculation. Severe or rough handling of sheep on the range or in the corrals is, therefore, thought to be the cause of this disease.

In order to determine the effect of calcium arsenate upon livestock an 11-acre field of alfalfa was dusted with it, one half of the field at the rate of 3 lbs. to the acre and the other half at double that strength. The alfalfa hay was harvested and stacked 10 days after dusting, at which time samples were taken for chemical analysis. After remaining in the stack for about 6 months the hay was fed to horses, cattle, and sheep, which were allowed all the hay they would consume at two daily feedings, water and block salt being available at all times. Having been fed for a period of 80 days in this manner nearly all animals were found to have gained in weight and were in the best of health.

Foot-rot in sheep, D. S. Bell (*Ohio Sta. Bimo. Bul. 145 (1930), pp. 110–114, fig. 1*).—A practical account of this affection of sheep and its treatment.

[Control of the stomach worm in sheep], E. H. Hostetler (*North Carolina Sta. Rpt. 1929, pp. 59, 60, 61*).—Control work with the stomach worm in lambs through sanitation was commenced at the central station but was not sufficiently advanced to warrant conclusions. The drenching of lambs with nicotine sulfate solution every 28 days from May to October was conducted at the branch station at Statesville and the central station at Raleigh, the undrenched groups of five lambs each gaining the most during the first two and three months, respectively, after which there was a decided advantage in favor of the drenched lambs. All of the lambs in the undrenched group at the central station died and all but two in the undrenched group at the branch station, while all the lambs in the drenched groups showed gains at the close of the experiment.

Studies in fascioliasis in Oregon sheep and goats, J. N. Shaw and B. T. Simms (*Oregon Sta. Bul. 266 (1930), pp. 24, figs. 10*).—This report is based upon studies under way since 1926 in continuation of those of Chandler previously noted (E. S. R., 44, p. 581), all attempts to destroy snails on fluke-infested land having failed. Fluke ova were found to hatch in varying lengths of time, from 14 days to 13 months and 20 days. Freezing killed embryonated ova but did not affect those not embryonated. Miracidia lived as long as 24 hours after hatching. Miracidia attacked four species of Lymnaea and one of Physa. To *L.* (*Galba*) *bulimoides* Lea, the first definitely determined host for *Fasciola hepatica* on the North American Continent, *L.* (*G.*) *ferruginea* Hald. has been added. Lymnaeae are widespread throughout Oregon even at very high elevations. Snails lived at 37° F. for a month without food when water was provided. Cercariae are capable of living in snails and being discharged for more than 6 months from date of infestation. Individual snails are capable of living with large numbers of cercariae in them, 580 having been discharged from one specimen.

Carbon tetrachloride in 1-cc. doses destroyed mature and nearly mature flukes in livers of sheep and goats. Snails were destroyed by the broadcast of copper sulfate, but such destruction did not prevent their reappearance on the same pastures the following year. The cost of application was $5.25 per acre. Copper sulfate broadcast in twice the amount necessary to kill snails was not poisonous to sheep.

Anthelmintics for the removal of thorn-headed worms from swine, W. H. Wright and H. B. Raffensperger (*U. S. Dept. Agr., Misc. Pub. 79 (1930), pp. 12*).—A brief review of the literature reporting experimental results first presented by Wright is followed by a report of tests of anthelmintics for the removal of *Macracanthorhynchus hirudinaceus* made by Raffensperger.

It was found that ethereal extract of male fern, kamala, a hyperactive solution of iodine, oil of chenopodium, and liquor cresolis compositus were entirely ineffective in the removal of thorn-headed worms in the doses and manner used. Kamala extract had too little efficacy to be of any promise and apparently does not warrant further test. It is concluded that tetrachlorethylene should be tested in larger doses. Nicotine sulfate shows some promise for the removal of thornheads, especially when given with carbon tetrachloride, and this combination deserves further test. "The doses of the nicotine sulfate and carbon tetrachloride mixture used were injurious to the animals treated, but perhaps a satisfactory dosage and mode of treatment may be developed."

[Work with poultry diseases and their control at the Rhode Island Station] (*Rhode Island Sta. Rpt. [1929], pp. 70–72*).—In further work with internal disinfectants (E. S. R., 61, p. 676), metaphen was tested as to its effect on pullorum disease of baby chicks. It was found to be nontoxic to such chicks when given orally in doses as large as 0.75 cc. in a 1:500 dilution. It appears, however, to have little, if any, germicidal action on *Salmonella pullorum* in the digestive tract of the chick when used in a practical dilution. Its use in drinking water in a dilution of 1:20,000 seems to aid in the control of the spread of the disease from chick to chick. A 1:40,000 dilution in drinking water reduces but does not entirely prevent the transmission of the disease from naturally infected to healthy chicks.

By feeding *S. pullorum* in capsules and by hypodermic injections into the windpipe it has been demonstrated that infection may take place through both the digestive and respiratory tracts. Carefully controlled experiments indicate that in the brooder the infection which takes place is largely due to the picking up of the organisms from the droppings of diseased chicks from the floor or in the drinking water by the healthy chicks. A study of the eggs from a flock of 20 hens that had reacted to two or more tests for pullorum disease showed that there is a great irregularity in the elimination of *S. pullorum* in the egg, as has been reported by other investigators. Six of the hens did not give off the organism at any time in the course of the experiment, while 25 per cent of the eggs from one bird yielded the organism. There did not appear to be any relation between the time of elimination of the organism and the period of the clutch.

In a study of various therapeutic agencies employed in blackhead disease of turkeys, including neoarsphenamine, arsenic trioxide, ipecac, iron and strychnine citrate, organic sulfur, and others, all proved to be of little value. In the course of the work a bacterium was discovered in the blood stream of blackhead cases. This organism was found to be pathogenic for baby chicks, pigeons, and turkey poults, and may prove to be either an etiological factor in blackhead disease or a secondary invader.

In post-mortem examinations made of all available cases of birds succumbing to fowl paralysis, infestations of either roundworms, tapeworms, or cecal worms persisted, the latter being almost constantly present. Efforts to transmit the disease artificially were unsuccessful. Strychnine, arsenic, organic sulfur, and kamala were used in an attempt to bring about recovery of the affected birds, only strychnine appearing to give beneficial results.

The treatment of coccidiosis in a severely infested flock of young birds by means of sour milk was quite effective in checking losses. Metaphen administered orally and per rectum seemed to be of great value and quinine sulfate and β-naphthol used alternately in therapeutic doses produced good results. Arsenic and organic sulfur proved to be of no value.

Bacillary white diarrhea and related diseases of chickens, P. R. Edwards and F. E. Hull (*Kentucky Sta. Bul. 296 (1929), pp. 235–280, figs. 2*).—In the first and greater part of this bulletin the authors report upon studies made of the methods employed for detecting pullorum disease infection. A summary is given of work with the intradermal test as compared with the agglutination test (pp. 239–249), in which a commercial antigen was used, and an earlier account of which has been noted (E. S. R., 58, p. 178). This is followed by an account of work with the slide agglutination test (pp. 249–256), the details of which have also been noted from another source (E. S. R., 60, p. 374).

In work with the precipitation test in comparison with the agglutination test (pp. 256–259), several methods were used in the preparation of precipitin antigens from *Salmonella pullorum*, the most satisfactory antigens obtained being the saline washings from heavy suspensions of *S. pullorum*. The test was found to be more efficient in detecting infected individuals having a relatively high agglutination titer, as was expected, the agreement between the two tests decreasing as the agglutinative titer declined. Repeated testing followed by post-mortem examination of the birds giving positive agglutination and negative precipitin tests proved that these birds were almost without exception carriers of *S. pullorum*. The birds giving positive precipitin and negative agglutination tests were, as far as could be determined, noninfected individuals. It is concluded that while the precipitin test as employed is apparently of some value in the detection of the disease, it is obvious that it is not so sensitive as the agglutination test and until a more sensitive antigen is developed will not be of practical value in diagnosing pullorum disease.

A report is made of the results of comparative tests of serum in eight different laboratories, conducted in a manner similar to those reported by B. A. Beach and A. C. Merrick.[1] Serums of blood from 24 hens, placed in small bottles and preserved by crystals of thymol, were subjected to tests by eight laboratories. It was found that, granting the majority report to be correct in each instance, the agreement of the eight laboratories for the 24 samples was 96.4 per cent. It is pointed out that the addition of thymol caused, in some instances, a heavy white precipitate which made the tests very difficult to read. Further, the agglutinins in fowl serum acting upon *S. pullorum* are not nearly as active after the preservatives have been added to the serum. The great uniformity obtained is considered to have demonstrated that comparable results may be obtained with the agglutination test for the detection of *S. pullorum.*

In a study of the constancy of the agglutination test in the detection of pullorum disease 93 reacting hens were tested at monthly intervals for one year. The mortality in the group was 34.4 per cent during the year, confirming observations of other workers that the mortality among carriers of this infection is very high. The results of the test, made at a dilution of 1 to 40, were surprisingly constant, only 6 of 984 tests made of the 93 hens during the year being negative, and these 6 negatives were confined to 4 birds. It is recommended that where a fairly high percentage of infected birds is found on the first test the flock be retested after an interval of from 45 to 60 days. This interval is considered sufficient for incipient infections to develop to the point where they may be detected, and will lead to the detection of infected birds that were missed on the first test. The number of retests that will be required will vary with the percentage of reactors in the flock and the number found upon retesting.

In studying the transmission of pullorum disease among hens (pp. 267–271), 73 which yielded positive reactions to the agglutination test were kept during one year in a house 15 by 30 ft. with 15 hens which did not react to the test. They were allowed to range over a large yard at all times and were trap nested in order to minimize the possibility of transmission through ingestion of infected eggs. Four of the 15 hens died during the course of the investigation, none having given a positive agglutination test or giving evidence of pullorum infection upon post-mortem examination. Five of the 11 that survived the experiment became infected during the year, 1 in the third month, 1 in the seventh month, 2 in the eighth month, and 1 in the tenth month, *S. pullorum* being recovered from the ovaries of each. The others in the experiment never gave a positive test, and *S. pullorum* was not isolated from them on post-mortem examination. The findings are considered to indicate that pullorum disease is transmitted from hen to hen by contact.

In studying the time necessary for agglutinin production (pp. 271–275) 16 pullets and 16 cockerels were fed cultures of *S. pullorum.* At the age of 9 months they received 500 cc. of a saline suspension of *S. pullorum*, the density of which was 0.25 on the MacFarland nephelometer. Following the feeding, all of the birds appeared to be suffering from an acute infection, including a pronounced diarrhea. The egg production of the pullets was reduced to 50 per cent of the prefeeding level and remained at this low rate for 3 weeks, the prefeeding normal being regained in the sixth week. At the end of 10 days all of the birds had apparently recovered. The details of the agglutination tests, taken weekly for the first month and monthly thereafter, and of post-mortem examinations are presented in tabular form. Seven of the birds, of which 6 were pullets and 1 a cockerel, became permanent reactors and *S. pullorum* was isolated from them at post-mortem. The bacilli were localized in the ovaries of the pullets and in the testicle and vas deferens of the cockerel. Thirteen birds, 3 pullets and 10 cockerels, gave temporary reactions which later disappeared. Post-mortem examination of these 13 birds showed no lesions of white diarrhea nor was *S. pullorum* isolated from any of them. Agglutinins appeared in the blood of 6 of the fowls within 7 days after feeding *S. pullorum*; they were present in 16 of the fowls 14 days after feeding. One fowl did not react until the twenty-first day, another first reacted on the thirtieth day, 1 on the thirty-seventh day, and 1 on the sixty-ninth day. Since these late reactions were very slight and temporary, it is considered doubtful that they were directly connected with the feeding. The findings seem to indicate that in retesting of flocks for recent infections and missed cases the retesting should not be done for 45 or preferably 60 days following the original test.

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[1] Poultry Keepers' Assoc., Petaluma, Calif., [Pub., 1927], pp. [6, 7]; abridged in Amer. Poultry Jour., 58 (1927), No. 3, pp. 404, 405.

The work concludes with a report (pp. 275–280) of studies of an epizootic outbreak among some 2,000 3-day-old chicks in which the mortality was approximately 25 per cent before the first case of coccidiosis was detected. The symptoms noted closely resembled those of bacillary white diarrhea. Two organisms of the paratyphoid B group, identified by the agglutination and agglutinin absorption tests as *S. aertrycke* and *S. anatum*, were isolated from the affected chicks. It is pointed out that *S. anatum* has never before been recorded from chickens.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Nebraska Station] (*Nebraska Sta. Rpt.* [*1929*], *pp. 8–10*).—Operating cost data from studies of combining showed that the total cost of harvesting wheat varied from 26.12 cts. per bushel where 2,070 bu. were harvested from 230 acres, using a 10-ft. combine, to 5.86 cts. per bushel where 9,310 bu. were harvested from 500 acres by a 12-ft. combine. The cost per acre varied from $1.06 to $5.04.

Experiments on the adaptation of small electric motors to farm use showed that 3-h. p. electric motors for operating a hay hoist gave highly satisfactory results. Work with grinders indicated little sacrifice in grinding efficiency when small machines are used in place of larger ones.

Surface water supply of Pacific slope basins in Oregon and lower Columbia River Basin, 1926 (*U. S. Geol. Survey, Water-Supply Paper 634* (*1930*), *pp. VI+236, fig. 1*).—This report, prepared in cooperation with the States of Oregon and Washington, presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1926.

Surface water supply of Pacific slope basins in California, 1926 (*U. S. Geol. Survey, Water-Supply Paper 631* (*1930*), *pp. IX+419, fig. 1*).—This report, prepared in cooperation with the States of California and Oregon, presents the results of measurements of flow made on streams in the Pacific slope basins in California during the year ended September 30, 1926.

Surface water supply of minor San Francisco Bay, northern Pacific and Great Basins in California, 1895–1927, H. D. McGlashan (*U. S. Geol. Survey, Water-Supply Paper 637–A* (*1930*), *pp. VI+68*).—This report, prepared in cooperation with the State of California, presents a summary of records of measurements of stream flow in the three series of basins from 1895 to 1927.

The Green River and its utilization, R. R. Woolley (*U. S. Geol. Survey, Water-Supply Paper 618* (*1930*), *pp. XV+456, pls. 35, figs. 29*).—Following a preface by N. C. Grover, this report presents the facts regarding the available water supply of the basin of the Green River, the largest tributary of the Colorado River, and other data that will be helpful in planning to put this water to beneficial use.

Twenty-eight years of irrigation experiments near Logan, Utah, 1902–29, inclusive, D. W. PITTMAN and G. STEWART (*Utah Sta. Bul. 219* (*1930*), *pp. 15, figs. 12*).—This is a brief summary of experiments conducted at the Greenville Experimental Farm, which have been concerned mainly with the effects of different quantities of irrigation water, the minimum water requirement of crops, and the effects of different seasonal distribution of the water.

Under average conditions on this farm irrigation water beyond 20 or 25 acre-in. usually gave little or no increase in the yield of sugar beets, potatoes, alfalfa, corn, or small grains. There was no run-off of water as it was all held by dikes until it sank into the soil. More than 30 acre-in. usually reduced the yield of all crops grown except alfalfa, which continued to return increased yields up to 60 or more inches of applied water.

The average season of the year when a single irrigation was most effective was as follows: Sugar beets, late July; potatoes, early August; and small grains, early June. Alfalfa responded about equally to water applied at any part of the growing season. The most vigorous crop growth on this soil occurred when it was maintained at about five-eighths of its total water-holding capacity. Heavy irrigations notably reduced the fertility of the soil, as measured by nitrates and by available phosphates.

Irrigation practices in growing alfalfa, S. FORTIER (*U. S. Dept. Agr., Farmers' Bul. 1630* (*1930*), *pp. II+26, figs. 24*).—This is a revision of and supersedes Farmers' Bulletin 865 (E. S. R., 38, p. 434). It describes farm irrigation systems and ditches and deals especially with methods of irrigating alfalfa.

[Drainage studies at the Everglades Substation] (*Florida Sta. Rpt. 1929, p. 95*).—In connection with investigations on the movement of underground water, which indicated the feasibility of local drainage operations in the Everglades, studies on the establishment and deportment of mole lines or formed lines of seepage showed "that the mole principle might be made an unusually effective and economical agent in the solution of one of our most important problems, namely, a closer manipulation of the water table in organic soils under conditions of cultivation."

Public Roads, [June–July, 1930] (*U. S. Dept. Agr., Public Roads, 11* (*1930*), *Nos. 4, pp. 61–80*+[*2*], *figs. 33; 5, pp. 81–111*+[*2*], *figs. 39*).—These numbers of this periodical contain, respectively, the status of Federal-aid road construction as of May 31 and June 30, 1930, together with the following articles:

No. 4.—Illustrations of Frost and Ice Phenomena, by I. B. Mullis (pp. 61–68, 79); Progress Report on the Connecticut Avenue Experimental Road, by P. F. Critz and J. H. Eldridge (pp. 69–76, 80); and Some Points of Contact between Soil Science and Highway Engineering, by J. S. Joffe (pp. 77–79).

No. 5.—Calibrations of Accelerometers for Use in Motor Truck Impact Tests, by J. A. Buchanan and G. P. St. Clair (pp. 81–109, 111), and Program for International Road Congress Announced (pp. 110, 111).

The air seasoning of wood, J. S. MATHEWSON (*U. S. Dept. Agr., Tech. Bul. 174* (*1930*), *pp. 56, pls. 22, figs. 14*).—The threefold purpose of this bulletin is to present the general principles involved in the drying of wood, to show their application to air seasoning, and to offer suggestions for better air-seasoning practice.

Relation of dust fungicides to flow of small grains through drills and to drill injury, R. W. LEUKEL (*U. S. Dept. Agr. Circ. 119* (*1930*), *pp. 10*).—The results are reported of experiments on the effect of various dusts on the flow of grain through grain drills and on the drill itself, and on the added effect of atmospheric moisture and rain. These results indicate that while some of the fungicidal dusts used retarded the flow of grain through the drill more than others under the conditions of the experiment, none of them caused a sufficient decrease in the quantity of dry dusted grain sown to affect appreciably the acre yield or to necessitate any change in the setting of the drill when sowing above 6 pk. per acre.

It was found that dry dusted wheat flows through the drill more readily and requires less change in the drill setting than wheat which has been subjected to the wet formaldehyde treatment and sown while still slightly wet. This is shown by the greater decrease in the flow of moistened wheat. The reduction in stand due to seed injury commonly caused by formaldehyde also must be considered in this comparison. According to the results obtained, dry dusted wheat should require no alteration in the drill setting unless the rate of seeding is 6 pk. per acre or less, in which case it would not be amiss to increase the rate of seeding by 1 pk. per acre. Dry dusted seed is not likely to cause injury to the drill even after it has remained in the drill for several days, unless the drill is allowed to stand out in dew or rain so that the seed becomes wet. However, under the conditions of these experiments wet undusted seed caused more difficulty than wet dusted seed.

Drill trouble can be avoided by not allowing grain to stand in drills in the open for long periods, especially in rainy weather. If this does occur, however, care should be taken to stir the grain thoroughly before sowing and to loosen the gears by rocking the drill wheel back and forth by hand. In the drill with external force feed the feed gates should be opened to remove the grain that may be caked about the feeding gears. It is important that the drill bearings be oiled frequently when dusted wheat is being sown, especially in wet weather.

Dusts used for testing air cleaner efficiency, A. H. Hoffman (*Hilgardia [California Sta.], 5 (1930), No. 2, pp. 17–33, figs. 10*).—Studies of the characteristics of 21 dusts representative of the range of dusts used for air-cleaner testing by different agencies are reported.

When screen methods failed to give a satisfactory basis for comparisons, a method by air flotation and settling was devised and used. The method involves the sending of weighed samples of the several dusts into a pipe-line system through which a constant rate of air flow is maintained. The dust that settles in each part of the system is weighed separately, and that which floats through is calculated. The results for dusts actually used for air-cleaner testing show a range of 96 to 39 per cent settling, or 4 and 61 per cent, respectively, floating through. A dust still finer shows 28 per cent settling and 72 per cent floating through. The percentage of floatability is taken as measuring the difficulty a dry centrifugal type air cleaner would encounter in handling a given dust. Examples are cited showing that this type of cleaner fails to protect satisfactorily against excessive wear under severe dust conditions. Suggestions are made for making dust of proper characteristics for the testing of air cleaners, and a machine for dust production is described.

Precooling of fresh fruits and temperatures of refrigerator cars and warehouse rooms, E. L. Overholser and B. D. Moses (*California Sta. Bul. 496 (1930), pp. 34, figs. 9*).—This bulletin is a contribution from the station and the California Committee on the Relation of Electricity to Agriculture. Studies were made of air and fruit temperatures in commercial warehouse cold storage rooms used for precooling, air and fruit temperatures at different positions within the refrigerator car as affected by car precooling, the rate of temperature drop in the fruit within the packages and in the air outside the packages, and the differences in rate of temperature fall as affected by the kind of fruit and type of package.

In the warehouse, when pears were surrounded by air currents having temperatures of 30 to 35° F., it required from 45 to 50 hours to cool the centers of the fruit packed in the centers of standard boxes from 60 to 75° down to 33 to 35°. Packed boxes of grapes cooled somewhat more rapidly than did packed boxes of pears, as the individual fruits were not so tightly packed together and were unwrapped. Grapes were cooled from 60° down to 35° in about 33 hours in a warehouse. The precooling of wrapped oranges packed in standard orange boxes required more time than did any of the other fruits studied. Oranges in the centers of each half of the divided orange box were cooled from 74° down to 35° after about 64 hours' storage in warehouse temperatures of 33°. Warehouse precooling is adapted to concentrated fruit areas, shipping terminals, or commercial centers, while the portable type of cooler is adapted to those areas not having warehouse facilities, and to small shipping centers or individual packers.

Loading of different styles of packages together in one end of the car obstructs air circulation and interferes with the effectiveness of car precoolers and the natural circulation of cold air from the ice bunkers. When the individual fruits of a package are wrapped and tightly placed together, the rate of cooling is retarded as contrasted with that of fruit which is unwrapped and loosely packed. The wrappers serve as insulators and also reduce the space for air movement, so that the heat is of necessity removed primarily by conduction. Open packages and loose packs permit convection currents, and thus facilitate the removal of heat. Small fruits cool somewhat more rapidly than large fruits, as the small fruits have a larger surface per unit of volume, and this permits of more rapid reduction in temperature. Packed, wrapped pears in the centers of standard boxes were cooled from 69.5 to 59.7° with 6 hours of operation of a car precooler when the car was loaded only with pears. In a mixed load containing plums, grapes, and pears, the temperature of the pears in the center of the boxes was lowered from 67.5 to 63.5° with 6 hours' operation of the car precooler. Grapes in Los Angeles lugs were cooled from 60.8 to 52.3° within 3 hours.

Wrapped packed peaches with ice only dropped 3.4° in 2 hours after loading. When a car precooler was operated during the same interval of time, the temperature of the peaches in another similar car dropped 8.2° The fruit in the car with the precooler continued to cool through the afternoon while that in the plain iced car warmed up, until after 7 hours of operation the drops were 1.8 and 15.4°, respectively.

The importance of the initial fruit temperature as influenced by the time of day the fruit is harvested and packed is emphasized in view of the comparative difficulty in removing the heat after the fruit is packed.

Milk cooling on California dairy farms, B. D. Moses and J. R. Tavernetti (*California Sta. Bul. 495 (1930), pp. 34, figs. 15*).—This bulletin is a contribution from the station and the California Committee on the Relation of Electricity to Agriculture. It discusses the so-called wet and dry types of mechanical milk-cooling systems, and reports the results of tests.

These results indicate that when the brine system is used about 0.12 kw.-hour of power is consumed per gallon of milk, when the milk is cooled and stored in 10-gal. cans, 0.17 kw.-hour if stored in bottles, and if cooled and not stored, about 0.09 kw.-hour per gallon of milk. When cooled and stored or not stored, the direct expansion system being used, about 0.05 kw.-hour is consumed per gallon of milk.

Estimating electric power at 2 cts. per kilowatt-hour, depreciation at 10 per cent, interest at 7 per cent, and upkeep at 3 per cent per annum, a milk-cooling plant will cost from 0.5 to 1 ct. per gallon cooled, depending on the size and type of plant and the method of handling the milk.

If a storage box is needed, a floor space of 15 by 15 in. should be allowed for each 10-gal. container that is to be stored. Where the milk is stored in quart bottle cases, a space 16 by 20 by 12 in. should be allowed for each case. The equivalent of 3 to 4 in. of sheet cork should be used for insulation of the brine tank or storage box. If the brine system is used the tank should contain from 1.5 to 2 gal. of brine for each gallon of milk cooled per day. A 0.5-in. centrifugal brine pump driven by a 0.25-h. p. motor is sufficient for circulating the brine where less than 200 gal. per day are cooled. A 0.75 in. centrifugal pump driven by a 0.25-h. p. motor is sufficient where 200 to 400 gal. of milk are cooled per day. The aerator should be of the two-way type, with water passing through the upper half and brine through the lower half. Approximately 6 in. of horizontal length should be allowed for each 10 gal. of milk cooled per hour.

The milk should be cooled to about 10° F. below the temperature at which it is to be delivered to the distributing plant. About 40° is the usual desired temperature of cooling over the aerator. The storage box temperature should be kept a few degrees lower than this temperature.

Mechanical refrigeration of milk in a tank type refrigerator, F. E. Price, C. J. Hurd, and G. V. Copson (*Oregon Sta. Bul. 268 (1930), pp. 27, figs. 10*).—The results of experiments, conducted by the station in cooperation with the Oregon Committee on the Relation of Electricity to Agriculture, on milk cooling by mechanical means are reported. The experiments were applicable to the dairy farm where milk is marketed in 5- or 10-gal. cans.

It was found that milk in 10-gal. cans will cool from 95 to 60° F. or below in 1 hour and to 56° in 2 hours when set in 35 to 40° water. When the milk is precooled with a tubular surface cooler to 67°, it will cool to 55° in 1 hour and to 52° in 2 hours in 10-gal. cans when set in 35 to 40° water. Milk in 10-gal. cans will cool from 95° to below 50° in 1 hour and to 42° in 2 hours when set in 35° water that is circulated around the cans. When the milk is precooled with a tubular surface cooler to 67°, it will cool to 44° in 1 hour and to 42° in 2 hours in 10-gal. cans when set in circulated water to 35°. The bacterial content of milk will not increase during the first 12 hours when kept in 10-gal. cans in a tank of 35 to 40° water. Stirring milk in 10-gal. cans set in 35 to 40° water does not materially increase the rate of cooling.

Three in. of corkboard or its equivalent should be used in insulating a dairy refrigerator box. The annual average power requirement to cool 100 lbs. of milk below 50° in an insulated-tank type cooler in approximately 1 kw.-hour. It is less expensive to cool milk below 50° in tank type cooler with mechanical refrigeration using electricity at 3 cts. per kilowatt-hour than with ice at 0.5 ct. per pound.

Plans are given for an insulated concrete milk-cooling tank.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the North Carolina Station, 1928–29], G. W. Forster (*North Carolina Sta. Rpt. 1929, pp. 15–25*).—Investigations not previously noted are reported on as follows:

The costs by items of growing strawberries for the first, second, and third years in the Chadbourn district and Duplin and Pender Counties are tabulated. The total costs per quart, including interest, free on board local station were 9.2 and 8.7 cts., respectively.

The study of farm credit made in cooperation with the U. S. D. A. Bureau of Agricultural Economics shows that the average costs in 1926 of cash loans from different sources were banks 8.1 per cent, agricultural credit corporations 7.3, landlords and other individuals 7.1, insurance company 6, other sources 8.9, and average of all sources 7.7 per cent. The average costs of merchant loans were store 28.5 per cent, fertilizer company 22.7, landlord 10.1, other sources 12.9, and average of all sources 25 per cent.

The study of cotton marketing at 11 local cotton buying points indicates that (1) the buyer's spread at all points varied considerably within any combination of color, grade, and staple, (2) that less than ⅞-in. staple was bought at more and 15/16-in. and better staple at less than central market values, and (3) that the average price paid for strict middling and good middling grades of white cotton was generally less and that for strict low middling greater than the central market value.

[Investigations in rural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 145 (1930), pp. 125–128*).—Included are articles as follows:

The trend of agricultural production in Ohio since 1910, V. R. Wertz (pp. 125, 126).—A table is given showing the annual index numbers 1910–1928 (1910–1914=100), of the physical volume of production and sales of Ohio farm products. The indexes for 1915–1919, 1920–1924, 1925–1928, respectively, for production and sales were 108 and 116, 107 and 114, and 106 and 110.

Ohio farm land area and total production, J. I. Falconer (p. 127).—The table and text show that while volume of production has increased as shown above, land in farms decreased 2 per cent from 1910 to 1920 and 8 per cent to 1925 and population decreased 17 per cent from 1910 to 1925.

Index numbers of production, prices, and income, J. I. Falconer (p. 128).—The table previously noted (E. S. R., 63, p. 383) is brought down through April, 1930.

[Investigations in agricultural economics at the Rhode Island Station, 1929] (*Rhode Island Sta. Rpt. [1929], pp. 63–65*).—Besides results of investigations previously noted, brief summaries are included of the studies of where Providence housewives purchase eggs, cost accounts kept in 1928 on 5 dairy farms, and business records kept in 1928 on 167 farms in the State.

Farm credit in North Carolina: Its cost, risk, and management, D. L. Wickens and G. W. Forster (*North Carolina Sta. Bul. 270 (1930), pp. IV+128, figs. 17*).—This bulletin reports the results of a study made in cooperation with the North Carolina Department of Agriculture and the Bureau of Agricultural Economics, U. S. D. A., of the credit situation in three areas of North Carolina at the beginning of 1927. It is based chiefly upon data obtained by personal interviews with 40 owners and 16 tenants in Wake County in the Piedmont region, a county devoted primarily to tobacco production with cotton, corn, and poultry secondary; with 37 owners and 20 tenants in Johnston and Harnett Counties, representative of the Coastal Plain and where nearly all farmers specialize in cotton with corn and hay produced only for feed and livestock production limited; and with 20 owners and 6 tenants in Craven County, representative of the lower Coastal Plain or Tidewater region where tobacco is the main crop, but where cotton, truck crops, and livestock are also important. Supplementary information was also obtained through schedules from banks, merchants, and other dealers in farm supplies, from agricultural credit corporations, and from questionnaires mailed throughout the State. The chief purpose of the bulletin is to give the facts found as to existing credit usage and costs and other conditions of borrowing and to suggest some possible ways of improving existing methods. The data are analyzed for each area for owners and tenants.

Part 1 discusses the capital and credit used, the conditions giving rise to borrowing, the purposes for which credit is used, kinds of credit used and terms for which used, and the kinds of farm using credit. Part 2 discusses the costs of short-term credit—merchant and cash—and the conditions giving rise to the high costs for such credit. Part 3 deals with services of different lending agencies and the advantages and weaknesses of each. Part 4 discusses the risks to lenders on short-term loans and compares the charges for such credit with the dangers of loss. Part 5 describes the condition of mortgage credit and the purposes for which used and the trends in the credit system. Part 6 deals with farm credit management and the consequences of the present use of credit.

A number of suggestions and recommendations are made as to methods of improving the present credit conditions.

Credit problems of North Carolina cropper farmers, H. H. Wooten (*North Carolina Sta. Bul. 271 (1930), pp. 42, fig. 1*).—This study was made in cooperation with the North Carolina Department of Agriculture and is based upon detailed financial reports for the year 1928 obtained by the survey method from 112 farm owners in 4 counties in the Coastal Plain region and 230 croppers on the same farms. Tables are given and discussed showing for each county the amounts, terms, costs of and losses from cropper credit, and the factors affecting each. Comparisons are made with credit extended to owners.

Suggestions are included for improvements in the organization and management of cropper operated farms, the reduction of cropper credit costs, and the elimination of risks and losses from such credit.

Stock share renting in Virginia, R. A. Ballinger (*Virginia Sta. Bul. 271 (1930), pp. 54, figs. 6*).—This bulletin is based upon records taken from 111 farms in 25 counties of the State. The common provisions of the stock share leases studied are described, with tables showing for the different sections of the State the shares of fifteen items furnished by landlords and the shares of receipts received by landlords. The financial returns to landlords and tenants under such leases are discussed. A suggested form of stock share lease is included, and the various items in such a lease are discussed.

Land utilization and farm management in Wyoming County, P. I. Wrigley (*Pennsylvania Sta. Bul. 257 (1930), pp. 40, figs. 13*).—This bulletin, reporting a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, gives the results of "one of a series of studies of the more hilly and stony parts of Pennsylvania to determine what factors make land submarginal for farming." It is based chiefly upon reports taken for 1928 on 50 farms. Tables are given and discussed showing for each farm, grouped according to type of soil, labor income, farm and family earnings, acreage in hay and other crops, productive animal units, income from livestock, and value of crop sales. Typical farms of different types and the status and possibilities of forestry in the county are discussed more fully.

A brief summary and conclusions are given of the indications shown regarding future farm consolidation and abandonment and farming in the county.

Planning the ranch for greater profit, L. P. Gabbard, C. A. Bonnen, and J. N. Tate (*Texas Sta. Bul. 413 (1930), pp. 45, figs. 10*).—Detailed records were obtained by field men at regular intervals from 23 ranches in 1925, 27 each in 1926 and 1927, and 29 in 1928. Survey records were also taken on 15 selected ranches in 1928. The physical features of the area and their relation to the distribution of cattle, sheep, and goats; the trend in the number of livestock in the area; and the size and organization of the ranches studied and the changes during the period studied are described. Multiple correlation analysis of 61 individual operations with incomes per section ranging from $2,000 to $44 showed that the percentage of young raised, wool and mohair clip, death losses, prices received, and the rate of stocking of cattle, sheep, and goats accounted for approximately 73 per cent of the variation in incomes per section, the first three factors accounting for almost 50 per cent of the variation.

Using the tables of livestock production and production requirements, of herd requirements, replacements, death losses, sales, etc., and of prices for items bought and sold, detailed budgets are shown for an actual organization of 16.5 sections with 33 cattle and 17 goats per section, and a revised organization with 15 cattle, 27 sheep, and 8 goats, and one with 15 cattle, 35 sheep, and 8 goats. The net incomes per section were $405, $765, and $950, respectively, for the three organizations.

The study was made in cooperation with the Bureaus of Agricultural Economics and Animal Industry, U. S. D. A.

The livestock system in Iowa County, J. A. HOPKINS, JR., and R. S. KIFER (*Iowa Sta. Bul. 270* (*1930*), *pp. 205–236, figs. 8*).—This bulletin is the third of the series previously noted (E. S. R., 62, p. 83) and is based upon 22 records obtained in 1925 and 1926 and 18 in 1927 on 28 Iowa County farms in a cost study route. The variations in the hog enterprises on the several farms, the relationships to the labor supply, average costs of production, reasons for high costs, and the variations in requirements on spring and fall pigs, and the influences of size on the cattle enterprise, variations in costs of production, and types of cattle enterprises—family milch cows, small dairy herds, medium and large sized beef herds, and commercial feeders—are discussed. Poultry and combinations of livestock enterprises are dealt with briefly.

The study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

A partial analysis of the Missouri pig survey reports, F. L. THOMSEN and P. RICHARDS (*Missouri Sta. Research Bul. 139* (*1930*), *pp. 34, figs. 16*).—The purposes of this study were (1) to test the accuracy of pig survey reports as indicators of production changes from a State, local, and individual standpoint; and (2) to isolate the factors affecting hog production changes in Missouri. The first part of the study was based on paired reports from different surveys for identical farms in the nine districts of the State as follows: June, 1927, and December, 1927, 1,035; June, 1927, and June, 1928, 418; December, 1927, and June, 1928, 805; December, 1927, and December, 1928, 685; and June, 1928, and December, 1928, 503.

Comparisons are made of the current and historic answers in the four surveys in 1927 and 1928 to questions regarding sows farrowed and the number of pigs saved. These showed a variable memory bias for the several districts, usually positive, and in some cases quite marked. The district errors were compensating, and the average for the State showed a relatively small error due to memory bias. Intentions to breed were seldom realized, the number of sows bred being practically always larger than the number farrowed. The identical survey records showed a variation for the State of about 7 to 8 per cent in the realization of breeding intentions for the spring farrow and from 9 to 10 per cent for the fall farrow. A comparison of the survey indications for Missouri from the spring of 1923 to the fall of 1928 with the marketings from the State, October, 1923, to September, 1928, showed that only in 1924 and 1925 were the discrepancies as high as 5 per cent.

The study of the changes in production in the 9 districts of the State indicated wide differences according to the density of hog population. Districts of greatest production showed increases in farrowing when other districts showed declines. Differences in the number of sows farrowed were offset in many cases by differences in the number of pigs saved. The number of pigs saved seemed to be lowest in the districts of greatest hog population. No definite tendency was found for changes in production to be associated particularly with either the spring or fall farrows. Little relationship was found between the size of the individual sow herd and increases and decreases in the number of sows farrowing as shown by the spring surveys for the State, but there was a marked relation for the fall farrowings.

Economic aspects of apple production in Washington, N. W. Johnson (*Washington Col. Sta. Bul. 239* (*1930*), *pp. 79, figs. 7*).—Records of cash outlays and estimated labor were obtained for 82 (81 in 1926) orchards in the Wenatchee district for the years 1926, 1927, and 1928, and for 86, 88, and 87 orchards in the Yakima district for the respective years. Tables are given and discussed showing for each year for each district for the orchards from zero to 15 acres and fom 15.1 to 30 acres the average investment, rate of return on investment, farm income, labor income, maximum cash available for family living, and total family living; and for each district the average cost of producing apples, by items, during the period studied. Other tables show the cost of producing apples on 17 Wenatchee district orchards operated by hired managers, and the number of farms in each district producing apples at different costs in the different years. Data are also given as to investment, yield, variety, quality, costs, and profits on the 10 most profitable and the 10 least profitable Wenatchee district orchards; the average yield of different varieties in the two districts, by years; the labor expenditures, by items, per acre of apples in the two districts in 1926; and the results on 43 orchards with and 37 orchards without filler trees in the Yakima district in 1928. The present status and outlook of the Washington apple industry, fixed and variable costs of production, the present filler practice of the Yakima district, the effect of yield and price on net returns, the relative profits from different varieties of apples, and ways and means of reducing costs of production are discussed.

For the period studied the average cost, including interest but not depreciation, of apples delivered at the warehouse was $1.171 per box in the Wenatchee district and the average receipts $1.291 per box, leaving a net profit of 12 cts. per box, or $64.57 per acre. In the Yakima district for the 43 orchards without filler trees, the average cost was $1.048 per box and the average returns $1.179 per box, leaving a profit of 13.1 cts. per box, or $63.45 per acre. On the 43 orchards with filler trees the cost was $1.062 per box, returns $1.207 per box, and profits 14.5 cts. per box, or $66.63 per acre. The cost on 17 large manager-operated orchards in the Wenatchee district was $1.436 per box and the receipts $1.219 per box, the loss being due largely to low yields, less desirable varieties, and the necessity of hiring all labor. Depreciation on orchards amounted to 7 cts. per box in the Wenatchee district and 6 cts. per box in the Yakima district. In the Wenatchee district fixed costs were 42.52 per cent and variable costs 57.48 per cent of the average cost of production.

Cost and efficiency in pear production in the Rogue River Valley, R. S. Besse, W. S. Brown, and L. P. Wilcox (*Oregon Sta. Bul. 267* (*1930*), *pp. 56, figs. 27*).—This bulletin is based upon records from 58 bearing pear orchards in 1924, 52 orchards in 1925, and 52 in 1927. Tables and charts are included and discussed showing the average costs of production, cash and noncash, by items, per acre, ton, box, and tree; the effects of different factors on yields and costs. the labor practices and labor requirements; and the organization and earning power of the pear farm business.

The average cost of production for the 3 years was $1.48 per box, distributed as follows: Labor 44.65 per cent, materials 7.25, machinery 6.02, general expenses 10.48, depreciation 6.8, and interest on investment 24.8 per cent. Of the costs, 80 per cent were preharvest and 60.8 per cent cash costs. The average yield per acre and the average price received per box were in 1924, 110 boxes and $1.92; in 1925, 130 boxes and $1.68; and in 1927, 180 boxes and $1.80.

On 55 per cent of the farms the average cost of production for the 3 years was $1.50 per box and less, and on 21 per cent over $2.01. The 10 most profitable farms spent $47.69 per acre more than the average of all the farms, but the cost per box was 28 cts. less. The use of commercial fertilizers reduced the average cost 10 cts. per box, and the use of cover crops reduced the cost 26 cts. per box below that on the farms using neither cover crops nor fertilizer. From 5 to 9 cultivations appeared more profitable than either more or less cultivations. Orchardists spending more than 10 hours per acre in combating blight produced pears at a cost of 11 cts. per box lower than those devoting less than 10 hours. On orchards sprayed more than 3 times, the costs were 8 cts. per box less than on those sprayed 3 times or less. Growers spending from 26 to 40 man hours per acre in pruning received the highest profit per acre. Heated orchards averaged $7 per acre larger profit than unheated orchards. Orchards with from 15- to 20-year-old trees produced at the lowest cost per box and the greatest profit per acre. Orchards irrigated two or more times produced 24 boxes per acre more than those irrigated but once.

The 3-year averages showed the following, respectively, for the 20 per cent most profitable farms and for all farms: Acreage of bearing pears 57 and 39, yield per acre 206 and 140 boxes, man hours of labor per acre 173.3 and 131.98, farm income $12,137 and $3,507, labor income $8,067 and $748, profit per acre $148 and $49, and earnings on investment 13.6 and 4.9 per cent.

Business procedure in shipping grain direct from producing to consuming sections, L. F. Rickey (*Illinois Sta. Circ. 359 (1930), pp. 20, figs. 5*).—Information is given as to the possibilities, advantages, and disadvantages of direct shipments of grain, the purchase contract and the factors to be considered in it, methods of settlement, shipping of grain, etc. Forms for purchase contract, certificate of deposit, affidavit of weight, and car report are included.

The marketing of Delaware cantaloupes, I, H. S. Gabriel (*Delaware Sta. Bul. 165 (1930), pp. 24, figs. 2*).—The cantaloupe industry in the United States and Delaware is described, and the production and marketing practices in Delaware as they affect marketing are discussed and recommendations made.

The market situation and outlook for the Oregon canned fresh prune, M. N. Nelson and W. H. Belden (*Oregon Sta. Bul. 263 (1930), pp. 30, figs. 6*).—The status of the prune industry in the United States, especially Oregon, is analyzed, and the possibility of canning as an outlet for Oregon prunes, canning practices, sales methods and policies, distribution of sales, costs, margins and profits, advertising, and sales promotion are discussed.

Buying tomatoes on grade, 1929, F. C. Gaylord and J. H. MacGillivray (*Indiana Sta. Bul. 336 (1930), pp. 19, figs. 6*).—The 1929 results in the study previously noted (E. S. R., 61, p. 690) are reported with comparisons with the years 1927 and 1928. The number of factories grading tomatoes increased from 9 in 1928 to 19 in 1929 and the tons of tomatoes graded increased approximately 300 per cent. Of the deliveries in 1929 at the stations buying on grade, 51 per cent were No. 1's and 3.19 per cent culls, as compared with 47.19 and 5.39 per cent in 1928 and 30.4 and 19 per cent in 1927. With the exception of two factories in 1929, growers received from 5 cts. to $2.62 per ton more than they would have received on a flat rate basis. The cost of inspection varied from 12.7 to 80.3 cts. per ton.

Three laboratory tests showed that U. S. No. 2 tomatoes contained 8 per cent less solids matter than No. 1's. Factory tests made with a load of good tomatoes (54.2 per cent U. S. No. 1's, 44.4 per cent U. S. No. 2's, and 1.4 per cent culls) and a load of poor tomatoes (15.6 per cent No. 1's, 80.1 per cent No. 2's, and 4.3 per cent culls) showed a total solids content of 4.78 per cent for the good and 4.16 per cent for the poor load. The good tomatoes produced 18 No. 10 cans more per ton than the poor load. Color measurements showed that No. 1 tomatoes give better colored finished pulp than No. 2's and both better than culls.

Price plans for marketing milk, R. W. Bartlett (*Illinois Sta. Circ. 358* (*1930*), *pp. 19, figs. 9*).—The classification or use milk-marketing plan used in the New York market, the basic-surplus plan used in the Philadelphia market, and the equalizing-value plan used in the Pittsburgh market are described and compared.

A price plan for selling milk by collective bargaining organizations, R. W. Bartlett (*Pennsylvania Sta. Bul. 251* (*1930*), *pp. 32, figs. 2*).—This bulletin is a continuation of the study previously noted (E. S. R., 57, p. 385). It discusses the basic facts pertaining to milk production and consumption, different price plans, and the principles fundamental to the price-determining processes. The new marketing plan known as the Pittsburgh Equalizing Value Price Plan, which was put into operation in the Pittsburgh market October 1, 1928, is described in detail. The basis for sale to distributors under this plan is "the sale of milk for each use at a price based upon its market value in each use."

Membership problems in a milk marketing organization, J. K. Stern (*Pennsylvania Sta. Bul. 256* (*1930*), *pp. 16*).—The data on which this bulletin is based were obtained through interviews with 902 members of cooperative organizations in the Pittsburgh milk market area. Tables are included and discussed showing the reasons members joined the organization, benefits of membership, sources of information regarding the organization, regular attendance at different kinds of meetings, age of members, and satisfaction with the butterfat test of the organization. Other tables show the relation of size of herd and success of the farmer and the differences as to success, attitudes, intelligence, interest in community improvements, credit and financial ratings, and other factors of members reporting benefits and no benefits from the organization.

A majority of the members reported receiving the benefits expected, but 23 per cent reported no benefits received. Lack of information and of understanding of the organization was the cause of most of the trouble. A house organ, field men, and a regular schedule of meetings are recommended as the best means of spreading information to members.

The marketing of eggs on a graded basis, E. R. Menefee (*Indiana Sta. Bul. 334* (*1929*), *pp. 19, figs. 7*).—This bulletin consists chiefly of an analysis of data for the period May, 1924, to December, 1928, inclusive, obtained from one locality, in which part of the egg-buying stations bought on a grade basis and part did not. At the stations grading eggs, the volume of eggs delivered steadily increased during the period and the percentages of No. 1 eggs increased slowly, being 73.1, 79.2, 79.1, 75.7, and 81.8 per cent, respectively, for the different years. The increase in the average price per dozen at grading stations over the flat price averaged 2.37 cts. in 1926, 3.1 cts. in 1927, and 3.17 cts. in 1928. The increase for June, 1927, was 5.21 cts. Interviews with 123 farmers selling on a grade basis and 83 in the adjoining territory where quality buying was not practiced showed that the former were more interested in adequate feeding, had more purebred and larger flocks, had better housing, did more culling, took better care of eggs, and marketed more frequently.

The advantages to buyers of buying on a grade basis are discussed.

Lamb marketing investigations in western Oregon, H. A. LINDGREN and E. L. POTTER (*Oregon Sta. Bul. 265 (1930), pp. 15, figs. 6*).—This bulletin is based upon data obtained by nine visits to the North Portland livestock market from November 14, 1927, to June 15, 1929, and visits to the San Francisco, Los Angeles, and Chicago markets. The study showed that top prices were paid for 60- to 80-lb. lambs in proper condition, that Easter lambs brought a fancy price, and that milk-fat lambs were in demand. The percentage of lambs of different kinds received at the North Portland market and the average price received for different types were for lambs in desirable condition 34.5 per cent and $13.44 per 100 lbs., too thin 47 per cent and $11.59, too heavy 8.5 per cent and $10.69, scrubs 4 per cent and $9.30, and long-tailed and bucky 6 per cent and $10.92, respectively.

San Francisco and Los Angeles were found to be desirable outlets for western Oregon early lambs. Shipments to Chicago showed a shrinkage of about 10 per cent, and 50 per cent had to be further conditioned on arrival. No satisfactory outlet was found for feeder lambs from western Oregon.

A lamb production program for western Oregon is outlined.

Motor transportation of hogs to the Indianapolis market, J. R. WILEY (*Indiana Sta. Bul. 337 (1930), pp. 30, figs. 15*).—Tables and charts are included and discussed showing the receipts of hogs at the Indianapolis market, by rail and by truck, 1913–1929; the seasonal variations in such receipts; the losses by death and crippling, by months, per 1,000 hogs transported by truck, 1924–1927, and by rail, 1922–1926; and the average charges per 100 lbs. and the average cost per ton-mile for trucking hogs different distances, together with the relative costs of transporting hogs by rail and by truck 30 and 90 miles.

The average losses per 1,000 hogs by death and crippling were, respectively, in truck shipments, 1924–1927 (most hauls less than 75 miles), 0.88 and 1.59 and rail shipments, 1922–1926 (most hauls from 75 to 175 miles), 1.57 and 3.04. For the year July 1, 1925, to June 30, 1926, the death and crippled losses were by trucks 0.8 and 1.78, steam railroads, 1.6 and 3.65, and interurban roads (most hauls under 75 miles) 1.05 and 3.77. The average truck charges per 100 lbs. increased very uniformly from 20.9 cts for hauls of from 18 to 22 miles to 49 cts. for distances of from 88 to 92 miles. The average costs per ton-mile were 20.9 cts. for hauls of from 18 to 22 miles, 16.4 for 28 to 32 miles, 14.6 for 38 to 42 miles, 13.8 for 48 to 52 miles, 13 for 58 to 62 miles, 11.2 for 68 to 72 miles, 11.4 for 78 to 82 miles, and 10.8 cts. for 88 to 92 miles.

The advantages of trucking and some methods of reducing losses and costs are discussed.

Marketing Indiana timber, W. LER. NEUBRECH (*Indiana Sta. Bul. [335] (1930), pp. 64, figs. 28*).—This bulletin discusses the principal types of timber buyers in Indiana, their needs and requirements, and the advantages and disadvantages of selling to each type. Information is included as to log grade rules, log rules, estimating the amount and value of standing timber, logging and transportation costs, prices paid for timber, methods of selling, and timber sale contracts.

Some factors affecting the cost of operation of retail feed stores in New York State, W. POWELL (*New York Cornell Sta. Bul. 505 (1930), pp. 126, figs. 3*).—The objects of this study were (1) to verify the financial and operating standards obtained in the study previously noted (E. S. R., 61, p. 287) by studying a different period and by including a different area and more stores; (2) to determine and measure statistically the influence of factors affecting the efficiency of retail feed store operation; and (3) to determine what differences in standards and results of operation and the factors affecting them typically relate to comparatively unchangeable factors, such as form of ownership, age of firm, and type of farming in the surrounding region. The study is based on data from 83 stores in two representative dairying sections and from all cooperative feed stores throughout the State. Seventeen of the stores were included in the previous study.

The amount, sources, and distribution of investment, the volume of sales, costs, net profit, and operating ratios for the 83 stores are analyzed and comparisons made with the stores studied previously and between the data for the two periods for the 17 stores included in both studies.

The study of the factors affecting efficiency is made primarily from the viewpoint of the store owners. Multiple correlation analysis of the relation between total operating costs of the 60 stores owning their buildings and the 4 operating ratios—sales per employee, number of days' sales outstanding in receivables, inventory turnover, and fixed property turnover—and distance from railroad siding gave a coefficient of 0.851. The percentage determination for the factors were 34.1, 8.7, 14.3, 8.8, and 6.5 per cent, respectively. Sales per ton of storage capacity were found to be a fair substitute for fixed property turnover. Percentage of cash was not a satisfactory substitute for days' sales outstanding in receivables.

The several operating ratios are discussed in their relation to the operating figures and their effects upon other factors, such as location, services rendered, and business methods. Stores merchandising only, doing a large volume of business, making a large proportion of sales directly from the car, giving no delivery service, and located directly on a railroad siding had the highest labor efficiency as measured by sales per employee. Credit efficiency was highest for the stores having a high percentage of cash sales, making no differentiation between cash and credit prices, and making a large percentage of sales on the car-door basis. The highest rates of inventory and fixed property turnover were in stores merchandising only, having a large sales volume, and making a considerable or a large percentage of sales from the car door. A large volume of sales increased efficiency as measured by most of the operating ratios and made for lower margins and costs and higher profits. Grinding service, direct sales from the car, and a large territory to serve were the chief factors tending to cause large sales. Leniency in credit terms and collections, delivery service, and location in business center or on a main road apparently did not attract volume of business. The effects on efficiency of grinding service, car-door sales, delivery service, cash sales, and distance from a railroad siding are also discussed.

There was no significant difference in the operating figures of the merchandising stores in the summer dairying and the summer and winter dairying regions. Stores in the summer dairying region had a higher percentage of cash sales and less bad debts, and those offering grinding service had higher gross margins and net profits. Age of firms did not affect volume of sales, but the older stores were less efficient in every respect, except in the use of fixed property. Cooperatives had smaller average investments, and membership cooperatives had a much smaller proportion of the capital invested by owners. Partnerships had an unusually large amount in accounts and notes receivable. Capital stock cooperatives were in the reverse position. The total costs of cooperatives were about 4 per cent of net sales lower than those of privately owned stores. Their gross margins were also lower, due to a larger volume of business and a greater efficiency in the use of labor and capital, resulting in less service to customers.

Tables are given covering considerable periods of years showing the average monthly retail prices of different feeds in central New York and the index numbers of such prices.

Crops and Markets, [June–July, 1930] (*U. S. Dept. Agr., Crops and Markets, 7 (1930), Nos. 6, pp. 193–224, figs. 3; 7, pp. 225–272, figs. 3*).—The usual tables, graphs, reports, summaries, and notes are presented. No. 6 includes an article on the cost of producing corn, wheat, and oats in 1929 in the different geographic divisions of the United States, with comparisons with the years 1924–1928, and of cotton in 1929, by yield groups. No. 7 includes the cotton acreage report of July 1, 1930; tables showing for the cotton States the sale of fertilizer in 1930 and the use of commercial fertilizer on cotton, 1929 and 1930; the pig survey as of June 1, 1930; and the world wheat outlook report.

Prices of Illinois farm products from 1866 to 1929, L. J. Norton and B. B. Wilson (*Illinois Sta. Bul. 351 (1930), pp. 485–566, figs. 28*).—This study is based chiefly on data obtained from the files of four newspapers, the records of two mills and two livestock buyers, and Government reports. Tables and charts are presented and discussed showing the yearly average prices at each point and for the State as a whole, so far as available, for corn, oats, wheat, flour, bran, rye, barley, hay, potatoes, apples, butter, eggs, chickens, hogs, cattle, veal calves, sheep, and horses from 1865 or before through 1929. The monetary influences on the prices of Illinois farm products during the period studied are discussed, and some data are given regarding prices for the period 1849–1865.

Prices of farm products in Utah, W. P. Thomas (*Utah Sta. Bul. 217 (1930), pp. 60, figs. 22*).—This bulletin consists chiefly of tables showing the monthly prices, January, 1910, to April, 1930, paid Utah producers for different agricultural products and the index numbers of such prices (1910–1914=100), the annual index numbers of United States farm prices, United States wholesale prices, prices of industrial stocks, industrial wages, farm wages, and Utah farm prices (a weighted index of 22 commodities), and charts showing the relations of the indexes for different Utah farm products and United States retail prices.

Farm value, gross income, and cash income from farm production.—Part I, Estimates by commodities and by States, together with production, disposition, and price data used, 1924–1928: Sect. 2, Livestock and livestock products (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. 354*).—This is part 2 of the report previously noted (E. S. R., 63, p. 183) and gives tables showing, by States by years, for cattle and calves, hogs, sheep and lambs, horses, mules, chickens and eggs, milk, wool, mohair, and honey and beeswax the number or amount on hand at the beginning of the year, production, disposition, price per pound, value of, income from, and other data.

Statistics of oats, barley, and grain sorghums (*U. S. Dept. Agr., Statis. Bul. 29 (1930), pp. 156*).—Statistics for the year ended December 31, 1928, with comparable data for earlier years, are included of the acreage, production, farm value, yield, planting and harvesting dates, crop conditions, intentions to plant, cost of production, standards, future trading, marketing, inspections, receipts and shipments, stocks, imports, exports, international trade, and prices.

Car-lot shipments and unloads of important fruits and vegetables for the calendar years 1927 and 1928 (*U. S. Dept. Agr., Statis. Bul. 30 (1930), pp. 164*).—Tables are included showing (1) for 18 important fruits and vegetables the car-lot shipments by State of origin, by months, and the car-lot unloads in 66 cities, by State of origin and by months, during each year; (2) the car-lot shipments, by years, of 19 less important fruits and vegetables; and (3) the total car-lot shipments and unloads in the 66 cities, by State of origin.

California: An index to the State sources of agricultural statistics.—Part I, Fruits, vegetables, and nuts, Sect. 1, compiled by L. O. Bercaw

(*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 31* (*1930*), *pt. 1, sect. 1, pp. XLII+342, 342a*).—This mimeographed bibliography of State sources of agricultural statistics, issued in cooperation with the College of Agriculture of the University of California, is section 1 of part 1 of the third of the series previously noted (E. S. R., 58, p. 385). Part I deals with the fruit, vegetable, and nut crops of the State.

Foreign trade of the United States, annual, 1790–1929: Fruits, C. G. Gries (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Sect. Rpt. 48* (*1930*), *pp.* [*2*]+*106, figs. 6*).—Tables and charts are included showing, by years, for different periods the amount and value of exports, imports, and reexports of different fruits (fresh, canned, preserved or prepared, and dried), and the shipments to and from Alaska, Hawaii, and Porto Rico for the period 1903–1929.

Foreign trade of the United States, annual, 1790–1929: Nuts, C G. Gries (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Sect. Rpt. 51* (*1930*), *pp.* [*1*]+*35, figs. 2*).—Mimeographed tables and charts are included showing for different periods, 1793–1929, the quantity and value of imports into and exports and reexports from the United States of different kinds of nuts and the quantity and value of shipments of nuts from the United States to Alaska, Hawaii, and Porto Rico and from them to the United States, 1903–1929.

Migration of sons and daughters of white farmers in Wake County, 1929, W. A. Anderson and C. P. Loomis (*North Carolina Sta. Bul. 275* (*1930*), *pp. 24, fig. 1*).—This study was made in connection with those previously noted (E. S. R., 63, pp. 185, 186, 284), and is based upon data regarding the sons and daughters over 14 years of age of 281 owner and 146 tenant families operating farms in 1929. Tables are given and discussed showing for each group and each sex the age distribution, extent of education, marital status, geographic mobility, place of residence, and occupation of the children away from home. Rank coefficients of correlations were obtained by the Spearman rank correlation method of the relations between occupations engaged in, size of place of residence, distance from parental home, and educational preparation of the children away from home. Some of the findings of the study were as follows:

Of children over 14 years of age 51 per cent of the sons and 54 per cent of the daughters of owners and 33 and 49 per cent, respectively, of the sons and daughters of tenants were away from home. The ratio of daughters to sons away from home was 106 to 100 for owner children and 145 to 100 for tenant children. The movement for both sexes for both types of families began at about 18 years of age, and by 30 years of age 70 per cent of the sons of owners and 71 per cent of those of tenants were away and 70 and 78 per cent, respectively, of the daughters. Daughters migrated earlier than sons and those of tenants earlier than those of owners. Forty-six per cent of the sons and 48 per cent of the daughters located in the open country and 37 and 33 per cent, respectively, in cities of over 10,000 population. Eighty, 65, and 30 per cent, respectively, settled within 50, 25, and 10 miles of the parental home. Almost half of the sons and slightly over half of the daughters became farmers or farmers' wives. Educational preparation was found to be associated with the size of the place to which children migrated and the occupations entered. Those who became farmers or farmers' wives averaged 6.8 grades of schooling, as compared with 8.8 grades in other occupations.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The Bureau of Home Economics: Its history, activities, and organization, P. V. Betters (*Inst. Govt. Research, Serv. Monog. U. S. Govt. No. 62*

(1930), pp. X+95).—The first chapter of this monograph, which is one of the series of service monographs of the United States Government, contains a concise history of the development of home economics in this country, with particular emphasis upon the part played by the National Government in the encouragement of extension teaching, research, and the general dissemination of information in this field as shown by the Smith-Lever, Smith-Hughes, and Purnell Acts; the nutrition investigations in the Office of Experiment Stations; the formation and expansion of the Office of Home economics; and the creation of the Bureau of Home Economics.

The second and third chapters deal, respectively, with the activities and organization of the bureau under the three main divisions of food and nutrition, textiles and clothing, and economics. Other information concerning the operation of the bureau is given in a series of appendixes.

What's wrong with college teaching in the social sciences? H. A. WOOSTER *(Jour. Polit. Econ., 38 (1930), No. 3, pp. 302–316).*—The conditions under which such teaching is carried on and its needs are discussed.

The county unit in school administration: Its present status in the United States, C. G. LEECH *(Amer. School Bd. Jour., 81 (1930), No. 2, pp. 37–39, 112, 114, fig. 1).*—The different types of county-unit school administration in the United States are discussed.

Educational values in 4-H club work, E. H. SHINN *(U. S. Dept. Agr., Ext. Serv. Circ. 128 (1930), pp. 24, figs. 13).*—This mimeographed circular, which is the first of a series concerning the educational values in 4-H club work, is based upon the answers to a questionnaire received from 184 State and county 4-H club leaders and county agricultural and home demonstration agents in 35 States and upon data obtained from conferences in several of the States with persons interested in club work.

The aims of club work and the accomplishment of the aims; the value of the work in training boys and girls in farming and home making, in stimulating savings, a desire for higher education, home, community, and self improvement, leadership, etc.; the home and community practices and improved practices adopted by parents traceable to club work; the extent to which club work brings schools and homes into closer contact, keeps boys and girls in school, and affects their school work; the need of variations in 4-H club work programs for boys and girls of different ages; the weaknesses of the 4-H club program; and the methods of keeping boys and girls in the work and of interesting parents are discussed.

FOODS—HUMAN NUTRITION

A study of some of the constituents of citrus fruits, loquats, roselle, and guava: Pectin, oils, and glucosides, O. D. ABBOTT *(Florida Sta. Rpt. 1929, pp. 60, 61).*—This progress report contains a summary of the method of extracting pectin from citrus fruits finally adopted as most satisfactory after an examination of various methods. The method consists in extracting the peel of the fruit with hot alcohol by means of a 5-gal. extractor of the Soxhlet type, drying the residue in vacuo at 60° C., extracting the dried pomace with 0.4 to 0.5 per cent citric acid solution at 90° for one hour, and finally precipitating the pectin with alcohol. It is stated that the pectin thus obtained is a grayish white powder, with no taste of the citrus fruit from which it was derived.

Determination and identification of organisms which cause the spoilage of canned vegetables in the South, O. D. ABBOTT *(Florida Sta. Rpt. 1929, p. 59).*—In continuation of the investigation noted previously (E. S. R., 62,

p. 392), corn was canned in three ways: (1) By intermittent sterilization, varying the time, (2) by one period sterilization in the water bath, varying the time, and (3) by steam pressure sterilization, varying the time and pressure. It was found that sterilization at 15 lbs. pressure for 60 minutes did not protect the corn from spoilage when it was packed tightly in cans with little water added. From the spoiled corn two pure cultures were obtained, one an aerobic, nongas-forming bacillus which caused a type of spoilage similar to flat sour when sterile canned corn was inoculated with it, and the other a gas former and apparently a facultative anaerobe.

Foods and drugs, J. M. Bartlett (*Maine Sta. Off. Insp. 135 (1930), pp. 8*).—This is the annual tabulation of the results of the examination of food and drug samples collected by the division of inspections of the State department of agriculture (E. S. R., 61, p. 693).

The determination of the nutritional status of rural school children in five representative counties in Florida, O. D. Abbott (*Florida Sta. Rpt. 1929, pp. 61, 62*).—This project has been completed with physical examinations and laboratory tests on 3,380 children in five counties of the State and dietary records for 2- or 3-day periods from 1,850 of these children.

The principal defects revealed by the physical examinations were hookworm, underweight, defective tonsils and teeth, and anemia. Rickets and goiter occurred less frequently among the native Florida children than among children from other sections. The children suffering from hookworm included 71 per cent of those who were overweight and 57 per cent of those who were of normal weight. Other children of normal weight were found to have defective tonsils and enlarged thyroid glands, although the greater proportion of the children having these defects were underweight. It is concluded that in a study of the effect of diet upon the health of children as determined by height and weight records, other factors influencing growth must be taken into consideration. Attempts to score the diets reported by the children gave little information which could be correlated with underweight or overweight.

The physical curd character of milk and its relationship to the digestibility and food value of milk for infants (*Utah Sta. Bul. 220 (1930), pp. 44, 45, fig. 1*).—In this progress report (E. S. R., 59, p. 790) it is stated that feeding experiments now being conducted on two groups of infants at the Salt Lake County Hospital, one receiving soft-curded milk and the other hard-curded milk, substantiate preliminary findings indicating the superiority of the soft-curded milk over the hard-curded for infant feeding.

Curd tests on milk from a number of goats gave variations of from 20 to 180 gm. curd tension. Although there is apparently as much variation in different samples of goats' milk as of cow's milk, the curd of goats' milk tends to be granular rather than elastic.

Preliminary experiments on evaporated milk indicate that there is a softening of the curd as a result of the evaporation process.

The vitamin contents of Philippine foods.—I, Vitamins A and B in Basella rubra, Capsicum frutescens, and Vigna sinensis, A. J. Hermano (*Philippine Jour. Sci., 41 (1930), No. 4, pp. 387–399, figs. 8*).—The leaves of basil, *B. rubra*, (libato or alugbati) and of chili, *C. frutescens*, and the green pods of cowpeas, *V. sinensis*, (sitao) were tested for vitamin A in curative tests with rats and for vitamin B by both pigeon and rat tests. From the limited amount of data presented, the author concludes that both the libato and powdered chili leaves are rich in both vitamins A and B, and that the sitao contains both vitamins A and B, but in smaller amounts.

Determination of whether chlorophyll, chlorophyll alpha and beta, the petroleum ether extracts of the yellow pigments of alfalfa, can be used

as a source of vitamin A in animal nutrition, O. D. ABBOTT (*Florida Sta. Rpt. 1929, pp. 59, 60*).—In this progress report (E. S. R., 62, p. 397) it is noted, in addition to findings previously reported (E. S. R., 60, p. 195), that ungerminated alfalfa seed protected rats against xerophthalmia and that ether extracts of alfalfa were slightly protective. No cures were effected with crystalline chlorophyll, methyl or ethyl chlorophillide, or phaeophytin.

The vitamin-C content of commercially canned sauerkraut, together with some observations on its vitamin-A content, B. CLOW, H. T. PARSONS, and I. STEVENSON (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 1, pp. 51–64, figs. 9*).—In this complete report of an investigation at the Wisconsin Experiment Station noted previously from a preliminary report (E. S. R., 63, p. 94), experimental data are reported and discussed on vitamin C tests conducted on six brands of commercially canned sauerkraut and on vitamin A tests with one of these brands.

In the C tests the protective method was used. One brand of the sauerkraut afforded good growth and complete protection against scurvy at a level of 2.5 gm. daily. Another brand did not protect at this level, but did at levels of 5 and 7.5 gm. daily. Three brands failed to protect at 5-gm. levels and one at 7.5. gm. These results show that two of the brands compared favorably with fresh raw sauerkraut (E. S. R., 62, p. 588). Three were distinctly less effective than the fresh sauerkraut and the poorest of all about one-half as effective.

It is emphasized that "no conclusions as to the probable vitamin-C content of products of the sauerkraut industry other than the sauerkraut itself put up in tin containers are warranted by these experiments."

In attempts to determine the vitamin A content of one of the brands of canned sauerkraut in comparison with fresh cabbage, two difficulties were encountered—the refusal of the rats to eat enough of the sauerkraut and the difficulty in securing satisfactory controls because of unequal distribution of vitamin A in cabbage. From the limited amount of data it was possible to secure it is concluded that the differences between the vitamin A content of sauerkraut and cabbage are more likely to be due to variations in the type of cabbage used or to the extent of the removal of the outer leaves of the head than to any considerable destruction of vitamin A during the processes of fermentation and canning.

Dietary requirements for fertility and lactation, I–III, B. SURE (*Arkansas Sta. Buls. 250* (*1930*), *pp. 67, figs. 7; 251, pp. 62, figs. 3; 252, pp. 50, figs. 11*).—The author has assembled and summarized in three bulletins his researches on the subject, begun in 1919 and previously published in various scientific journals.

I. *The rôle of fat soluble vitamins in fertility and lactation.*—The reports summarized in this bulletin have been noted previously as follows: (E. S. R., 51, p. 563; 53, pp. 62, 565; 57, pp. 896, 897; 60, p. 293). The final section consists of a historical review of the literature establishing the identity of vitamin E, including the work of Evans and of Mattill and their associates as well as the author's contribution.

II. *The rôle of vitamin B in lactation and vitamin requirements of nursing young.*—This is essentially a summary of papers noted previously as follows: (E. S. R., 57, p. 897; 59, p. 491; 61, pp. 92, 696).

III. *Pathological changes in nursing young of the albino rat suffering from vitamin B deficiency, and the rôle of vitamin B in infant nutrition.*—In addition to summaries of reports previously noted (E. S. R., 59, p. 894; 61, p. 697), this bulletin contains hitherto unpublished material dealing with the effect of uncomplicated vitamin B deficiency on the alkaline reserve of the blood of the lactating rat and her nursing young and on the glycogen content of the livers of nursing young of the albino rat.

A final section on the rôle of vitamin B in infant nutrition includes a review of the literature on the subject and the announcement of the production by the author of a vitamin concentrate from rice polishings which is said to be 500 times as potent in vitamin B and 150 times as potent in vitamin G as cow's milk. A footnote states that a further improvement in technic has resulted in a product 10 times as active as the above. The method of preparing the concentrate is not described beyond the statement that only organic solvents which are readily recovered by distillation are employed.

Effect of ultraviolet irradiation on the magnesium content of rats receiving reflected sunlight and a uniform stock ration, J. S. McHargue and W. R. Roy (*Amer. Jour. Physiol., 92 (1930), No. 3, pp. 651–655*).—The chief purpose of this investigation at the Kentucky Experiment Station was to determine whether or not a deficiency in ultra-violet irradiation was affecting to any appreciable degree the growth of stock rats kept in a room with no direct sunlight.

Two litters of 10 rats each were divided into equal groups, one of which was irradiated daily and the other not for a period extending from June 25 to August 19, 1929. Weights were taken of the two groups at weekly intervals during the experiment. At the end of the period the rats were chloroformed and analyzed, 3 from each group being used for analyses of the entire carcass and the remainder for analyses of the leg bones for calcium, magnesium, and phosphorus.

The irradiated rats showed a decided increase over the nonirradiated in live weight, dry weight, total ash, and certain mineral constituents. The most striking difference was a much lower content of magnesium in the carcasses of the irradiated than of the nonirradiated animals. In the leg bones the magnesium was also much lower in the irradiated than in the nonirradiated rats and the calcium and phosphorus somewhat lower.

It is concluded that one of the beneficial effects of ultra-violet irradiation is the elimination of an excess of magnesium.

Long time feeding experiments with activated ergosterol, I, C. E. Bills and A. M. Wirick (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 117–128, figs. 5*).—This investigation differed from many others on the toxicity of large doses of irradiated ergosterol in that the exact potency of the product tested was determined and the rat feeding experiments were continued from infancy to old age. In all cases the ergosterol was activated in arachis oil by exposure to the rays of a mercury vapor quartz lamp, preliminary tests having shown no great difference in toxicity of ergosterol irradiated in oil, in ether under a reflux, or as crystals in air, provided the antirickotic potency was the same.

In the first long-time series the ergosterol solution was standardized to contain 100 times the vitamin D content of average cod-liver oil, and the McCollum basal diet 3143 was used. Depressed growth rates and failure of reproduction in rats on different levels of activated ergosterol and on the same diet supplemented with cod-liver oil led to the conclusion that the diet was faulty in some respect other than in vitamins A and D. In the later series a modified Steenbock stock diet was used. On this, harmful effects of overdosage with activated ergosterol became distinct when about 4,000 times the minimum antiricketic dose was administered over an extended period. The addition of 3 per cent calcium carbonate to the diet accentuated the toxic effects of activated ergosterol, but the addition of disodium phosphate did not accentuate, and possibly lessened, the effect of the material. No protection to second generation rats was secured by feeding large doses of activated ergosterol to the mother, thus showing that vitamin D is not transmitted to any extent through the placenta. Slight protection was apparently given to suckling rats through the milk when the mother received enormous doses of activated ergosterol.

Rickets in rats.—XI, The alteration of calcium and phosphorus metabolism of normal and ricketic rats produced by irradiated ergosterol, H. B. Brown and A. T. Shohl (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 245–262*).—In this continuation of the investigation noted previously (E. S. R., 62, p. 694), alterations were followed in the calcium and phosphorus metabolism of normal and ricketic rats receiving doses of irradiated ergosterol, varying from small through optimal to toxic amounts. The metabolism studies were conducted in three periods of 1 week each for the normal animals and two periods of 1 week each for the ricketic. Röntgenograms were taken at frequent intervals, and at the end of the experimental period the rats were autopsied and portions of the ribs, heart, aorta, lungs, kidneys, stomach, and liver taken for histological examination and the femurs for chemical analysis.

The normal animals improved in weight and general well-being with increased doses of irradiated ergosterol (Vigantol) up to a maximum of 0.1 mg. per day. The bone ash became heavier and the calcium retention greater. With larger doses (0.5 to 2 mg.) the bone ash became lighter, there was a shift of calcium and phosphorus from the feces to the urine, and the positive balances were reduced or became negative. Extensive calcification was evident in nearly all of the organs examined.

The ricketic rats proved more resistant to increased dosage of irradiated ergosterol than the normal rats. Amounts up to 0.5 mg. daily brought about partial to complete healing and larger doses hypercalcification of the long bones. On amounts below 2 mg. the bone ash was from 10 to 15 per cent higher than that of the controls, while in the group receiving 2 mg. the bone ash was the same as that of the controls, but from 20 to 25 per cent below that of normal animals of the same age. The calcium and phosphorus retentions were slightly above those of the controls but below normal. Negative balances were obtained with 2 mg. of the irradiated ergosterol and a definite shift of calcium and phosphorus from the feces to the urine. There was no alteration in the ratio of calcium to phosphorus retained.

The authors' views concerning the mechanism of the action of vitamin D are as follows: "Vitamin D does not markedly affect the ratio of calcium and phosphorus retention. It is unable to alter deficient calcium and phosphorus retentions. However, in spite of the calcium and phosphorus metabolism, vitamin D causes calcification of the skeleton. This indicates that the action of vitamin D is to dissolve the lime salts from the shaft of the bones and deposit them in the growing end. The total mineral deposition is a resultant of these two reactions. Vitamin D insures the most efficient use of the minerals which are present in the body by regulating their intermediary metabolism."

The lesions in the skeletal muscles in experimental scorbutus, G. Dalldorf (*Jour. Expt. Med., 50 (1929), No. 3, pp. 293–298, pl. 1*).—During the course of routine examinations of the ribs of scorbutic guinea pigs, lesions of the intercostal muscles were found varying in degree with the characteristics of the bone lesions. A further examination of various muscle tissues showed that the muscle lesions in scurvy tend to favor certain locations, being more frequently near the junction of the cartilage and the bones, and particularly in the thoracic wall, the diaphragm, and other muscles subjected to stress or exercise. The theory of selective development of muscle degeneration at points of stress received further proof in the development of extensive lesions in the leg muscles of scorbutic guinea pigs which had been forced to exert themselves by being placed in a slowly revolving barrel.

Tooth growth in experimental scurvy, G. Dalldorf and C. Zall (*Jour. Expt. Med., 52 (1930), No. 1, pp. 57-63, pls. 4*).—Data are presented on the growth of the incisor teeth of guinea pigs on a basal vitamin C-free diet alone and with varying amounts of orange juice, tomato juice, or turnip greens as the source of vitamin C. In the opinion of the authors the rate of tooth growth following the administration of an antiscorbutic substance is roughly proportional to the dosage. "Under standard experimental conditions used in the testing of foodstuffs for antiscorbutic value, the rate of tooth growth would appear to be a precise indication of the degree of scurvy, being more delicate than the Sherman score and more constant as well as more simple than the Höjer method."

The growth rate was measured by clipping the exposed portion of one of the lower incisor teeth every fifth day and measuring its length with vernier calipers. For the data reported the animals were kept under observation for from 20 to 90 days.

Histological examination of the roots of clipped teeth with corresponding whole teeth showed a more normal appearance of the roots of the clipped than the normal teeth on partially deficient diets. This is thought to afford further proof of the observation noted above that stress in terms of usage exaggerates scorbutic lesions.

TEXTILES AND CLOTHING

Shirley Institute Memoirs, Vol. VIII, 1929 (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 8 (1929), pp. VI+210+II, pls. 2, figs. 77*).—This volume includes the following papers concerned with textile research on cotton: The Reflection of Light from Certain Surfaces and Its Application to the Lustre of Textile Materials, by G. A. R. Foster (pp. 1-18); Adsorption Hysteresis (pp. 19-26) and The Mechanism of the Adsorption of Water by Cotton (pp. 27-34), both by A. R. Urquhart; A Two-Phase Theory of the Absorption of Water Vapour by Cotton Cellulose, by F. T. Peirce (pp. 35-52); The Comparison of the Whiteness of Fabrics Using a Cube Photometer—Part I, The Instrument and Its Use, by A. Adderley (pp. 53-60), Part II, Theoretical, by M. O. Pelton (pp. 60-67); The Influence of Humidity on the Elastic Properties of Cotton—IV, The Rigidity of Soda-Boiled Cotton and Effects Thereon of History and Temperature, by F. H. Clayton and F. T. Peirce (pp. 69-86); The Swelling of Cellulose and Its Affinity Relations with Aqueous Solutions—Part I, Experiments on the Behaviour of Cotton Cellulose and Regenerated Cellulose in Sodium Hydroxide Solution and Their Theoretical Interpretation, by S. M. Neale (pp. 87-114); The Grating Periodograph for the Analysis of Series of Observations for Hidden Periodicities, by G. A. R. Foster (pp. 115-126); The Absorption, Transmission, and Reflection of Radiant Heat by Fabrics (pp. 127-135) and The Transfer of Moisture Through Fabrics (pp. 136-154), both by J. Gregory; The Chemical Analysis of Cotton—XX, The Reactivity of Plain and Mercerised or Other Swollen Cottons, by C. Birtwell, D. A. Clibbens, A. Geake, and B. P. Ridge (pp. 155-174); Statistical Methods in Textile Research: The Analysis of Complex Variations, by L. H. C. Tippett (pp. 175-196); and The Dry Weight of Cotton, by G. F. Davidson and S. A. Shorter (pp. 197-210).

Second report of the fabrics co-ordinating research committee, R. H. Pickard et al. (*London: [Gt. Brit.] Dept. Sci. and Indus. Research, 1930, pp. VIII+180, figs. 30*).—The second report of the committee reviews its activities since the previous report (E. S. R., 55, p. 195) and appends articles on The Fireproofing of Fabrics, by J. E. Ramsbottom and A. W. Snoad (pp. 16-94); The Action of Sunlight on Cotton in the Presence and Absence of Oxygen, by

G. Barr and I. H. Hadfield (pp. 95–112); The Determination of Waterproofness of "Porous" Waterproof Fabrics (pp. 113–139) and The Effect of Dimensions of Test-Pieces on the Results of the Tensile Test on Textile Fabrics (pp. 140–152), both by G. Barr; and Deterioration of Fabrics by Micro-organisms, by A. C. Thaysen and H. J. Bunker (pp. 153–180).

A comparative study of the protective value of certain fabrics in still and moving air, K. Hess, E. V. Floyd, and L. Baker (*Jour. Agr. Research [U. S.], 41 (1930), No. 2, pp. 139–146, figs. 4*).—In this investigation at the Kansas Experiment Station the same apparatus and technic were used as in a previous study by F. R. Clark, reported by Floyd and Baker (E. S. R., 57, p. 199). This consisted of analyses of 13 different fabrics and determinations of the electrical energy necessary to keep a body covered with these fabrics at a temperature of 36° C. (96.8° F.) under rigidly controlled conditions of relative humidity and temperature obtained in a specially constructed calorimeter. The present investigation was conducted in a room equipped in such a manner that the temperature and relative humidity of the air could be measured and regulated and the air blown into the air chamber of the calorimeter immediately before each experiment. By means of a specially constructed wind tunnel, which is described and illustrated, it was possible to blow air over the fabric in the calorimeter at definite velocities.

The materials tested included Canton flannel (nap in and out), knit cotton underwear, infants' knit vests (wool and cotton), navy blue flannel, and gray astrakhan (pile in and out). Data were obtained for all of these materials on the quantity of enmeshed air, thickness of the fabric, mass in ounces per square yard, protective ratios, and protective values in percentages when tested in still air and in winds of differing velocities. The conclusions drawn from the investigation are summarized as follows:

"The rating of the fabrics on the basis of increasing protective ratio was found to be the same in still air and in air moving at 2.2, 3, 4.5, and 8.5 miles an hour. The protective ratio of a fabric increases as the speed of the wind increases. An increase from 0 to 8.5 miles an hour corresponds to an average increase in protection of 5.67 per cent. When made into closely fitting covers, fabrics having a pile or nap afforded greater protection when the smooth surface was next to the body. This was found to be true in determinations made in both still and moving air."

HOME MANAGEMENT AND EQUIPMENT

Electric laundry equipment on the farm, W. T. Ackerman (*New Hampshire Sta. Circ. 34 (1930), pp. 15, figs. 3*).—Data on the electric laundry equipment on the 7 experimental farms of the New Hampshire rural electrification project are summarized.

Washing machines consumed an average of 0.6 kw. hour per week at an operating cost of 6 cts. Depreciation costs on washers were estimated to exceed current consumption costs in the ratio of 85 to 15 per cent, making the total of depreciation and current charges 41 cts. per week. Washing machines produced an average of 0.75 per cent of the total electric load per year, and 1 per cent of the expenditure for current.

The current used by flat irons averaged 1.6 kw. hours per week at an operating cost of 7 cts. Flat irons were responsible for 1.6 per cent of the total annual electric load, and for 2 per cent of the total expenditure for current.

Ironing machines were found to use an average of 2.1 kw. hours of electricity per week with a current cost of 9 cts., with depreciation costs three times the current costs. Ironing machines practically eliminate the use of hand irons where the two are used together, for the reason that the larger machine will do more work in one-third to one-half the time and with less fatigue. The agricultural trend or the formation of peak load during the summer season was evident with washing machines and flat irons, but not distinguishable in the load curves of ironers.

MISCELLANEOUS

Report of the director [of Connecticut State Station] for the year ending October 31, 1929, W. L. SLATE (*Connecticut State Sta. Bul. 318* (*1930*), *pp. 749–771*).—The work of the station during the year is briefly reviewed. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

[Annual Report of Florida Station, 1929], W. NEWELL ET AL. (*Florida Sta. Rpt. 1929, pp. 102+VI, figs. 13*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1929, and departmental reports, the experimental features of which, not previously reported, are for the most part abstracted elsewhere in this issue.

Forty-third Annual Report of [Nebraska Station, 1929], [W. W. BURR] (*Nebraska Sta. Rpt.* [*1929*], *pp. 52*).—This contains the organization list, a report of the work of the station, and a financial statement for the fiscal year ended June 30, 1929. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Fifty-second Annual Report of the North Carolina Agricultural Experiment Station, [1929], R. Y. WINTERS ET AL. (*North Carolina Sta. Rpt. 1929, pp. 125, figs. 13*).—This contains the organization list, a report of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1929. The experimental work not previously reported is for the most part abstracted in this issue.

Forty-second Annual Report of [Rhode Island Station, 1929], B. E. GILBERT (*Rhode Island Sta. Rpt.* [*1929*], *pp. 63–79*).—This report includes experimental work and meteorological data, for the most part abstracted elsewhere in this issue.

Biennial Report of Utah Agricultural Experiment Station, July 1, 1928, to June 30, 1930, P. V. CARDON (*Utah Sta. Bul. 220* (*1930*), *pp. 64, figs. 17*).—This contains the organization list and a report on the work and publications of the station during the biennium ended June 30, 1930. The experimental work reported is for the most part abstracted elsewhere in this issue.

The Bimonthly Bulletin, Ohio Agricultural Experiment Station, [July–August, 1930] (*Ohio Sta. Bimo. Bul. 145* (*1930*), *pp. 97–128, figs. 5*).—In addition to several articles noted elsewhere in this issue, this number contains Corn Planter Work Continues, by C. O. Reed (pp. 124, 125).

List and analytical index of publications of the Porto Rico Agricultural Experiment Station, E. H. LANGDALE (*Porto Rico Sta. Circ. 21* (*1930*), *pp. 42*).—A chronological list and a subject index to these publications are given.

Annual summary of publications, B. C. PITTMAN (*Utah Sta. Circ. 88* (*1930*), *pp. 11*).—This contains a summary of publications issued by the station for the fiscal year ended June 30, 1930, including abstracts of scientific and technical papers published outside the station series.

NOTES

California University and Station.—Giannini Hall, previously referred to (E. S. R., 58, p. 603), has been completed at a cost of $500,000. It is a four-story structure 280 ft. in length, and in floor plan and shape practically duplicates Hilgard Hall. While built primarily to house the Giannini Foundation for Agricultural Economics, it will also provide quarters for the present for the administrative officers of the College of Agriculture, the agricultural extension work, the departments of forestry and agricultural economics, the California Farm Bureau Federation, the U. S. D. A. Forest Experiment Station, and the local offices of the National Park Service.

Porto Rico Federal Station.—Dr. George Fouché Freeman, director since May 1, 1930, died at Mayaguez September 17. Interment was at Manhattan, Kans.

Dr. Freeman was born at Maple Grove, Ala., November 4, 1876. He was graduated from the Alabama Polytechnic Institute in 1903, and was granted the D. Sc. degree by Harvard University in 1917. His early work was mainly as a teacher of botany in the agricultural college of Massachusetts and Kansas, but from 1909 to 1918 he was in charge of plant breeding work at the Arizona Experiment Station and from 1921 to 1923 chief of the division of cotton breeding in the Texas Station. Some of his most notable work in later years had been done in the Tropics in the promotion of cotton breeding and the development of agricultural education and research, as noted editorially on page 607 of this issue.

Since entering upon his duties as director in Porto Rico on May 1, 1930, he had laid out on the college grounds and partially constructed a drainage system and a dam to provide irrigation water during the dry season, had located two quarries from which it is thought that building stone in amounts adequate to future station needs may be supplied at low cost, and had worked out a system for locating definitely and marking permanently all of the many important trees and shrubs. He had devised a method for extracting fiber from the midribs and stalk of the banana and its utilization as a home industry in weaving coffee and sugar bags, and he had begun a museum of the animal and plant life and agricultural products of the island.

T. B. McClelland, horticulturist of the station, has been appointed director in his stead.

West Virginia Station.—Black walnut canker, believed to have existed for 10 years or longer in the northeast portion of the State, has been discovered in 15 counties of West Virginia, reaching from Pennsylvania to the western Virginia border. While it has been observed also in adjoining counties in Pennsylvania and Virginia, no record is known of the occurrence of this fungus disease elsewhere in the country. It is feared that if allowed to spread unchecked, the disease will wipe out the black walnut just as blight already has killed about three-fourths of the chestnut in the State. Investigations are under way by the department of plant pathology to study the nature of the fungus, the extent of damage done, and possible methods of control.

Other projects undertaken recently by the station include methods of finishing two-year-old steers on grass and on grain, with a view to determining the cause of dark killing of beef cattle; control of Brooks spot and other diseases of the apple; amount of water consumed daily by growing dairy animals; and causes of bad flavor in shipments of cream.

R. S. Glasscock, assistant in veterinary science, has resigned to become instructor in animal husbandry in the University of Missouri.

American Association of Agricultural College Editors.—The seventeenth annual meeting of this association was held at Washington, D. C., from August 26 to 29. It was the first Washington meeting of the association and also the first group to utilize the facilities in the new administration building of the U. S. Department of Agriculture. Representatives of 27 States were in attendance, and their numbers were appreciably augmented by the editorial staffs of the Department, extension workers, and others.

The sessions were opened with an address of welcome by M. S. Eisenhower, U. S. D. A. director of information, and a brief presidential address by Bentley B. Mackay of Louisiana. Addresses were later given by Secretary Hyde and Dr. C. W. Warburton, director of extension work.

The program gave large attention to the extension and informational phases of the work, but also included a review of present-day publications from the standpoint of the librarian, by Cora L. Feldkamp of the Office of Experiment Stations; a discussion by Director Eisenhower of the system followed by the Department in allotting its printing funds; a symposium on professional improvement by J. R. Fleming, W. H. Darrow, J. E. McClintock, and W. C. Palmer; and papers entitled Interpreting Statistics, by A. B. Genung, and A Publications Exchange among States, by R. W. DeBaun.

The theme most directly associated with the experiment stations was that covered by A. A. Jeffrey of Missouri under the title Should Experiment Stations Compete with Scientific Journals? In this paper the view was taken that research workers are seeking publication for their work in increasing numbers through the scientific journals in preference to the various series issued by the stations themselves. This trend was attributed largely to a belief that the work is thereby brought more surely to the notice of other specialists in the immediate field. The advantages and disadvantages of such a condition were set forth, and the idea was expressed that while the matter is largely one to be decided by directors on the basis of institutional policy, a logical outcome would seem to be the gradual elimination of the separate station technical and research series.

A report presented by J. F. Cooper, chairman of the committee on terminology, announced that a mimeographed list of agricultural terms needing standardization and definition is being prepared for study with a view to ultimate adoption and submission to dictionaries for incorporation.

The usual exhibit of college and station publications was augmented by a supplementary noncompetitive display of illustrative material by various bureaus and offices of the Department. The sweepstake prize in the competitive classes was awarded to the New York State College of Agriculture of Cornell University.

Officers for the ensuing year were elected as follows: President, E. R. Price of Virginia; vice president, R. W. DeBaun of New Jersey; and secretary-treasurer, C. D. Byrne of Oregon. The preference of the association was expressed for Corvallis, Oreg., as the place of meeting in 1931.

Following the sessions a day was devoted to a land-grant college radio conference.

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EXPERIMENT STATION RECORD

Vol. 63 December, 1930 No. 8

From the viewpoint of agricultural research, the outstanding gathering of 1930 was doubtless the celebration by the New Jersey State Experiment Station of its fiftieth anniversary. This celebration took place at New Brunswick on October 8 and 9, and its importance was widely recognized. Over a thousand people, of whom nearly 200 were delegates sent by educational and research institutions, scientific and agricultural organizations, and other bodies from this country and abroad, assembled to do honor to the station, to pay tribute to its accomplishments, and to join in its rededication to future service. The first of the two days given over to the celebration was devoted largely to commemoration exercises on the college farm campus, mainly from a nontechnical point of view, and the second to a convocation by Rutgers University in special recognition of the educational and scientific aspects. In each case an appropriate and impressive program was carried out with a success attainable only by long and skillful planning and conscientious attention to detail. The result was a worthy observance of a notable occasion.

The broad significance of the celebration was well brought out in the opening remarks of Dr. A. F. Woods, director of scientific research in the U. S. Department of Agriculture, when he said that "a half century of service in finding and proclaiming facts underlying agriculture is a record worthy of the highest commendation. The world as well as the Nation and the State have felt the helpful influence of the work of this station. It has been in the past and is to-day an active, helpful unit in the great federation of workers ever seeking by new and improved technics and clearer vision to give man surer control of those factors of his environment that make up what we call agriculture."

The New Jersey State Station, it may be recalled, is one of the oldest, as well as one of the most widely known, experiment stations of this country. When it began its work in 1880 barely five years had elapsed since the opening at Middletown, Conn., of the first institution of this kind for which a direct State appropriation had been secured. The period was even shorter since formal organization had been effected in the other States then in the field—California, North Carolina, and New York (at Cornell University). The action of the New Jersey Legislature antedated the passage of the Hatch Act by seven years, and the station thus brought into being still has the unique distinction of maintenance without direct

Federal aid, though associated closely with the New Jersey College Experiment Station under a common directorship since 1895. The third station to be established by State action, its funds from this source have risen from an initial grant of not to exceed $5,000 per annum to $452,125 for the fiscal year ended June 30, 1930. The consistent support which the State has given has been exceeded in but few States, probably by none if the size and relative importance of their agricultural interests are taken into consideration. It is an impressive indication of the success of the institution in serving its immediate constituency.

In looking backward to the early days of the experiment stations, one is inevitably impressed with their close identification with individual leaders. In most of the States where these isolated institutions sprang up they were well-nigh personal undertakings. Connecticut had its Atwater and Johnson, California its Hilgard, and Cornell its Roberts, while in North Carolina the efforts of President Kemp P. Battle and director C. W. Dabney were well-nigh equally potent though perhaps not so widely understood. New Jersey, with Dr. George H. Cook, was no exception.

Called to the chair of chemistry and natural science of Rutgers College in 1853, Dr. Cook, in the words of the commemoration booklet issued by the station, "was one of the rare men, of broad vision, who recognized in agriculture a progressive industry, destined to become more and more intimate with chemistry, physics, and biology, and to use these toward placing the art of agriculture on steadily rising economic levels. As professor of geology and State geologist, he interested himself in the soil and water resources of New Jersey. He made a thorough study of the greensand deposits of the State and their value as a fertilizer. His constant contacts with the farm constituency, his service as secretary of the New Jersey State Board of Agriculture and as one of its leaders, made him a quickening force in the affairs of New Jersey agriculture." Largely through his efforts Rutgers College was designated by the legislature as the Land-Grant College of New Jersey in 1864, and in the same year a tract of about 100 acres was purchased by its trustees as a farm for "experimental and practical instruction." The early years were largely occupied with the improvement and development of this tract, but not a little was done in the way of fertilizer trials and similar work.

Dr. Cook, however, soon came to believe that what was really needed was a full-fledged experiment station. This feeling was strengthened after he had made in 1870, in company with Mr. James Neilson, subsequently a member of the State board of managers throughout the entire 50 years and its president since 1913, an investigation of the research laboratories and experiment stations then existing in Europe. In 1874 Dr. Cook reported that "the farm should be made an experiment station, where a competent chemist with assistants may be permanently employed in the analysis of fertilizers and the investigation of matters of agricultural interest. Here should be conducted those experiments on subjects of rural economy which require accurate records of weight, measure, and time. The appliances and means should here be provided to pursue such inquiries, without depending on their immediate profit for meeting the expenses necessarily incurred in their prosecution."

The project met with little favor and much opposition at the outset, but the movement gradually gathered strength as his efforts persisted, and in 1880 the station was authorized "for the benefit of practical and scientific agriculture and for the development of our unimproved lands." Dr. Cook was made director and organized and directed its work until his death in 1889. After a brief interregnum the directorship was bestowed, in 1893, upon Dr. E. B. Voorhees, and upon his death in 1911 upon the present able executive, Dr. J. G. Lipman, thus preserving a continuity of policy over the half century which has proved as beneficial as it is unusual.

An impressive feature of the commemoration exercises was the unveiling of the Cook-Voorhees memorial. This memorial is a bronze tablet suitably inscribed and attached to a large bowlder on the station grounds which marks the site of the Johannis Voorhees homestead, from which the first scientific investigations on the college farm were directed. The address at the unveiling was delivered by former President W. H. S. Demarest of Rutgers University, who pointed out that with regard to Dr. Cook "his teaching in the colloge, never moved by him to a minor place, became in the early and continuous development of his life and service but a small part of the active program he fulfilled. Beyond the college, the city, State, and Nation became his field of scientific enterprise. . . . His breadth of view and diversity of interest were marked and enduring in the midst of his paramount devotion to agriculture and the people concerned with it."

Additional and more specific testimony to the services of Dr. Cook was brought forward in the address by Mr. Levi H. Morris, of Newton, N. J., entitled The Experiment Station and the Farmer. "Dr. Cook," he pointed out, "had all the qualifications of the unsurpassed experiment station worker. It was he who made the first accurate geological survey of the State. It was he who taught the farmers of New Jersey the use of cover crops and how to increase the humus and plant foods of the soil. It was he who was responsible for the establishment of a department for the testing of fertilizers and feeds. . . . He also taught the farmers the value of fertilizers of their own production as well as commercial fertilizers purchased and how to apply them to obtain the best results. He taught the farmers how to produce feeds of the most value for the purpose for which they were to be used and how to use them intelligently and economically. . . . He taught them how to select the profitable farm animals. He taught them the improvement of dairy management. He taught them how to keep accurate accounts of their farm transactions. He taught them other matters which the farmer must know and use in his daily transactions to make the farming business a success, all to the betterment of New Jersey farming conditions."

To Dr. Voorhees, also, appreciative tribute was paid. "Like Dr. Cook," President Demarest said, "he impressed his personality and power of service on the whole State in a remarkably individual and enduring way. He was constantly visiting communities, clubs, homes; the State was his school; he taught and he explained and he organized; and his ideas and methods profoundly affected the whole rural life of New Jersey. . . . With great ability, aptness, and devotion he steadily and progressively advanced the work committed to him. He was himself a research worker of rare insight; he was an effectual leader and director of the growing staff over which he presided; he was ambitious and eager in new avenues and new movements of agricultural service. These were within the bounds of his own institution and far beyond them."

The unveiling of the memorial afforded an appropriate opportunity to voice well-merited appreciation of the services of the station's own leaders of the past. The university convocation gave recognition to the achievements of a number of outstanding contributors elsewhere to the cause of science and the advancement of mankind in our own day. Honorary degrees of doctor of science were conferred upon Dr. Leland Ossian Howard, "searching student of the life cycles and habits of man's most numerous and persistent enemies, whose scientific adventures and authorship have brought applied entomology to the layman"; Dr. Theobald Smith, "investigator in the comparative etiology and pathology of infectious and parasitic diseases, whose studies of nearly a half century have commanded recognition at home and abroad"; Dr. Curtis Fletcher Marbut, "international authority on soil geography and chief of the soil survey division of the United States Department of Agriculture, a bureau engaged in the world's greatest enterprise of intensive geographic investigation"; Dr. Lafayette Benedict Mendel, "research associate of the Carnegie Institution, who, while associated with the late Thomas Burr Osborne at the Connecticut Agricultural Experiment Station, was among the first successfully to use small experimental animals in the study of the nutritive value of proteins and other foodstuffs and to demonstrate the existence of vitamins"; Sir

John Russell, "teacher, author, investigator, and noted authority on soil science and the nutrition of plants . . . benefactor to the agriculture of all lands"; Dr. Sigurd Orla-Jensen, "international authority on the application of bacteriology to the dairy industry, whose work on lactic-acid bacteria has been of notable significance"; and, in absentia, Mr. Charles Lathrop Pack, "untiring advocate of the conservation of our forests and of the reforestation of our lands for the enrichment of the economic resources and of the aesthetic life of our people."

Throughout the celebration much was said as to the human element in research and the direct contribution of the New Jersey Station, but even more as to what may be termed its more technical aspects and its broad applications. Thus, Director Lipman in his address of welcome, entitled Fifty Years of Service to Agriculture, declared that "the story that is being told to us to-day carries with it a lesson and a promise. Crude methods have been refined. Wheat, sheep, and beef cattle have passed out of our scheme of things. Human and animal power have given place, in large measure, to the seething energy of the electric motor and the internal-combustion engine. Crude tools have been made more perfect and more numerous. There is more strength in our land, more vitality in our plants, and more quality in our livestock. Science has brought to us a new skill and a new confidence. It has shown to us many a mystery and has revealed many truths. Thus, we know how to build better soils, better plants, and better animals. We know how to defend them against insects, bacteria, fungi, and parasites. Our knowledge and skill have made it possible for us to become specialists in the fields of horticulture, dairying, and poultry keeping. They have given us higher standards of living, better homes, and a wider outlook on life."

The work of the agricultural experiment stations as a whole was effectively epitomized by Dr. Woods in his address on The Relation of Scientific Research to Agricultural Progress. In general, he said, they "have as a result built up a body of experimental evidence in relation to almost every aspect of agriculture and country life that is gradually changing the whole aspect of agriculture in enlightened countries from a haphazard, rule-of-thumb work for peasants to a dignified, interesting, and successful group of industries, able to hold their own and to render efficient service in civilized society." He recalled that "a half century ago it looked to the best scientific minds as if increase in population would overtake and pass our power to produce food to meet the need. The zero hour was set at about 1933. The day is here. Populations have increased at about the ratio figured but we can feed them all to-day more easily and cheaply than we could at any time in the past. There is less famine, less suffering, less hard work, and more leisure than ever before. The reason is that we have more accurate knowledge of the factors that must be controlled, and we control them better than ever before in the history of man. This knowledge we have gained step by step through carefully planned experiments and the development of what we call scientific method."

This conception was further developed by Sir John Russell, the convocation speaker, in an address entitled Science and Agriculture. Sir John reviewed in turn the contributions of the fundamental sciences to plant production through discoveries applicable to the use of artificial fertilizers and barnyard manure, problems in soil fertility, and many other directions, and outlined a number of questions, among them crop insurance, which are still waiting for these sciences to bring a solution.

Coupled with his plea for the continued development of the more scientific phases was an appeal to keep in full view the ultimate objective of practical service. An agricultural research institution, he declared, exists for the double purpose of gaining knowledge for "the advancement of knowledge and the good of mankind. Looking back over the history of the subject one finds that the two purposes are really much the same. The advancement of knowledge has often proved to be the way whereby some pressing practical problem has been solved, and it would be easy to quote examples where the dropping of an inquiry because it appeared unpractical has retarded the solution of some important practical problem. The agricultural expert must thoroughly master his subject before he sets out to advise farmers, and this may require abstruse investigations, unrelated to any practical problems whatsoever. The agricultural research institution has, however, a duty to the present generation, and its program should be so fashioned as to render the fullest possible service to the men on the land."

It is much easier to theorize as to the need of preserving a just balance between the theoretical and the practical than to exemplify this need over a long period of years. The commendation freely expressed by Sir John Russell and others of the success of the New Jersey Experiment Station is therefore gratifying alike to those intrusted with the immediate direction of this station and those interested in the progress of agricultural research in general. It has meant much to the cause of agricultural research and the upbuilding of agriculture that such institutions have been available for leadership. The recent celebration afforded an appropriate opportunity to pause in the day's work and acknowledge the obligation, before pressing on, in Director Lipman's words, as "worthy servants to the cause of American agriculture and worthy followers of the seekers of truth and of the dreamers of great dreams."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

College organic chemistry, E. E. Reid (*New York: D. Van Nostrand Co., 1929, pp. V+649, figs. 28*).—"The aim of this book is to present organic chemistry as a coordinated whole, to develop it logically, depending on the reasoning powers of the student and not to tax his memory. Many facts and details are presented, . . . but they are put in as parts of the whole. . . . The aim has been to utilize the capabilities of the best students and yet to present the subject in such a way that the less well prepared can grasp it."

The series is taken as the unit in presenting the subject, and the change in physical properties noted in passing through a homologous series is emphasized throughout. "To this end great effort has been made to obtain accurate physical data."

The contents are: Introduction; methane; methanol; building molecules; methane series; isomerism; halogen derivatives; alcohol; methanol series; ethers; sulfur compounds; alkyl derivatives of ammonia, phosphine, arsine, and stibine; oxo derivatives; acids; esters; some nitrogen compounds; organometallic compounds; the one carbon group; comparison of physical properties; polyhalogen and polyhydroxy compounds; polybasic acids; hydroxyl and carboxyl—hydroxy acids; amino and carboxyl—amino acids; oxo-acids; oxo-alcohols; ethylene hydrocarbons; derivatives of the ethylene hydrocarbons; acetylene hydrocarbons and derivatives; ureides; carbocyclic compounds; benzene; derivatives of benzene; homologues of benzene and some derivatives; aromatic oxo compounds; aromatic acids; polyphenyl compounds; fused rings; and aromatic heterocyclic compounds.

Colloids, H. R. Kruyt, trans. by H. S. van Klooster (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 2. ed., rev. and enl., pp. XIII+286, figs. 118*).—The general plan of the first edition (E. S. R., 57, p. 501) has been retained in the second, here noted; but "newer investigations . . . have considerably modified the author's ideas on several points and this changed point of view has been expressed in the present volume." Certain errors were found, also, and have been corrected, and some new material has been added.

The drying oils, K. H. Bauer (*Die Trocknenden Öle. Stuttgart: Wiss. Verlagsgesell., 1928, pp. [4]+354, figs. 21*).—This volume deals with the drying oils from the viewpoints of the following as principal topics: Description of the drying oils, including oils of the linseed oil type containing linolenic acid, oils of the poppy seed oil type free from linolenic acid, and oils of the wood oil type; the fatty acids of the drying oils; analytical methods applicable; the behavior on heating of the drying oils and of their fatty acids; alterations undergone by drying oils and by their fatty acids on exposure to the air; driers and varnishes; and technical applications.

An index to the chemical action of microorganisms on the non-nitrogenous organic compounds, E. I. Fulmer and C. H. Werkman (*Springfield, Ill.: Charles C. Thomas, 1930, pp. XIII+198*).—Following a preface and brief introduction explanatory of the nature and mode of presentation of the data, the subject matter is given the form of three tables in the first of which column

1 names the organism and substrate and column 2 the product and the authors credited with the observation of its formation, together with reference by date to an author bibliography. Table 2 lists substrate followed by product in column 1, organism, author, and reference in column 2. Table 3 has the order product and substrate, organism, and author plus date reference.

A rather full bibliography completes the volume.

A study of the antimony trichloride color reaction for vitamin A.—II, The dilution curve of cod liver oil with antimony trichloride reagent, E. R. Norris and A. E. Church (*Jour. Biol. Chem., 87 (1930), No. 1, pp. 139–146, figs. 2*).—Continuing the study of the specificity of the antimony trichloride color reaction for vitamin A (E. S. R., 63, p. 110), the authors have obtained dilution curves for five samples of good grade cod-liver oil and one of ratfish liver oil by the technic previously described.

The intensity of the blue color produced with the different oils was in no case a linear function of the concentration of the oil, nor were the type of curve and the deviation from a linear function the same for the different oils. Four of the oils gave curves somewhat similar in type, and in attempting to correlate them it was found that for values below 8 or 9 blue units the curves approximated curves of the type formula $X=aY^2+bY$. From the formulas of the curves the slopes of the curves at the origin, which would represent a tangent at that point, were calculated as $\frac{dX}{dY}$ where $Y=0$. These values were found to have similar ratios to one another as the vitamin A potencies of the oils as determined biologically by the method of Sherman and Munsell.

As many of the cod-liver oils on the market are flavored with essential oils which contain unsaturated compounds producing colors with the antimony trichloride reagent, several essential oils in chloroform solution were tested with the antimony trichloride reagent. Only one of the oils tested, cedar wood oil, gave a blue color. This had an absorption band with a maximum at $580\mu\mu$.

Attempts were made to extract the unsaponifiable substance completely from a saponified cod-liver oil. Chloroform solutions of the unsaponifiable substance representing various dilutions of the original oil when tested with the antimony trichloride reagent gave straight line dilution curves, but a complete extraction of the unsaponifiable matter with no losses was never obtained.

Absorption spectra in relation to vitamin A, R. A. Morton, I. M. Heilbron, and F. S. Spring (*Biochem. Jour., 24 (1930), No. 1, pp. 136–140, figs. 2*).—In this reply to the criticism of Rosenheim and Webster (E. S. R., 62, p. 113) that the selective absorption in the ultra-violet (broad band, maximum $328\mu\mu$) of liver oils can not in itself be taken as a criterion of vitamin A, as suggested by Morton and Heilbron (E. S. R., 59, p. 792), absorption curves for dehydroergosterol are given, showing that, unlike the curve for vitamin A, that of dehydroergosterol has four narrow bands. "The only similarity between the ultra-violet absorption spectra of dehydroergosterol and vitamin A is that they absorb in approximately the same region. Further, the intensity of absorption of dehydroergosterol is not greater than one-sixth of that shown by the absorbing constituent of liver oils."

The chemical investigation of "bios."—Part I, B. T. Narayanan (*Biochem. Jour., 24 (1930), No. 1, pp. 6–18*).—This investigation was concerned with attempts to determine the chemical nature of bios and its relation, if any, to vitamin B_1. A series of substances of known composition was first tested for bios activity as measured by yeast growth on a standard medium. The substances tested included nucleic acid and related substances, various substances thought at one time or another to be related to vitamin B, substances related to choline, Eddy's α- and β-bios fractions, and various miscellaneous substances.

None of these substances exerted a marked stimulating effect on the growth of yeast.

A commercial extract of yeast was then fractionated and the fractions tested for bios activity. Various steps in the fractionation were essentially as follows: (1) Hydrolysis in an autoclave at 15 lbs. pressure with a 20 per cent solution of barium hydroxide and removal of the barium by excess dilute sulfuric acid. This left the principal bios activity in the filtrate.

(2) Precipitation with neutral lead acetate, subsequent removal of the lead with hydrogen sulfide, and adjustment of the filtrate to pH 6.8. This left a bios activity almost exclusively in the filtrate, while vitamin B_2 remained in the precipitate.

(3) Adsorption on norite charcoal. No evidence of adsorption of the bios by norite was obtained.

(4) Treatment with 80 per cent alcohol. This was carried out on a concentrate of the filtrate from the norite treatment or the lead acetate treatment and resulted in a certain amount of concentration of the bios.

(5) Precipitation with phosphotungstic acid in sulfuric acid solution. The bios was almost entirely precipitated by this reagent.

(6) Silver fractionation of the phosphotungstic acid precipitate. This left the bios in the filtrate.

(7) Treatment with platinic chloride. The filtrate from this was concentrated to dryness, extracted with 80 per cent alcohol, and treated with a 10 per cent aqueous solution of platinic chloride. Most of the activity remained in the filtrate.

"The material obtained by the decomposition of the platinum filtrate contains 15.6 per cent of nitrogen (calculated on an ash-free basis) but no phosphorus. It does not give the following tests for various types of nitrogenous compounds: Carbylamine reaction, nitrosamine reaction, biuret test, Folin-Denis test, Millon reaction, ninhydrin reaction, and Denigè's test, but it gives a fairly strong reaction with Pauly's reagent. No precipitates were obtained on the addition of aqueous or alcoholic picric acid, mercuric sulfate (Hopkins's reagent), or mercuric chloride. Bromine is absorbed with great avidity, yielding a gummy resinous product. The 'bios' activity is inappreciably affected by treatment with nitrous acid or dilute nitric acid, but oxidation by warming with hydrogen peroxide for 30 minutes causes inactivation. All efforts to prepare a solid benzenesulfonamide failed, and no further evidence has yet been obtained to throw light on the chemical nature of the active substance."

The active concentrates were examined for inositol with negative results. They exhibited a bios activity in doses considerably smaller than those reported by Eddy and his associates for their preparations (E. S. R., 53, p. 204) or those described by Miller and his associates (E. S. R., 51, p. 561).

The concentration of vitamin B_2, B. T. NARAYANAN and J. C. DRUMMOND (*Biochem. Jour., 24 (1930), No. 1, pp. 19–26, figs. 4*).—The lead acetate precipitate noted in the above paper was subjected to fractionation in attempts to concentrate vitamin B_2, and the various fractions were tested for B_2 activity by feeding experiments on young rats weighing about 50 gm. each. The rats were fed a diet consisting of casein 20, starch 74, and a special salt mixture 4 parts, with 40 mg. daily of a cod-liver oil of tested vitamin A and D strength and enough of vitamin B_1 concentrate prepared by the method of Kinnersley and Peters (E. S. R., 60, p. 94) to permit satisfactory growth if the diet were otherwise adequate. The test material was administered after growth had quite or almost entirely ceased and was considered active when the rats grew at the rate of at least 10 gm. a week.

Several substances which, for one reason or another, might possibly have been suspected of having been related to vitamin B_2 were tested with negative results in all cases.

The various steps of the fractionation process were as follows: (1) Preparation of the lead acetate fraction. The lead acetate precipitate, prepared as noted in the preceding paper, was decomposed by suspending it in warm water and slowly adding 10 per cent sulfuric acid until the solution was acid to Congo red. The lead sulfate was removed by filtration and the filtrate neutralized with sodium hydroxide. This proved to be active, promoting growth in daily doses representing from 10 to 15 mg. of organic matter.

(2) Adsorption on fuller's earth. At pH 0.1 the removal of the active factor by fuller's earth was almost complete, but great difficulty was encountered in removing the adsorbed active factor.

(3) Adsorption by norite. This proved very ineffective as an adsorbent.

(4) Fractionation with alcohol. On treating the fraction resulting from the decomposition of the lead acetate precipitate with absolute alcohol to a concentration of 50 per cent, an inactive slimy precipitate was obtained. The filtrate on concentration was found to be active in daily doses of 9 mg. of organic matter and to contain about 88 per cent of the activity of the original fraction. On raising the percentage of alcohol to 70 per cent another slimy, dark-brown precipitate was formed which proved to contain practically all of the active material, giving good growth in daily doses containing 6 mg. of organic matter. Further fractionation of this concentrate is in progress.

A further study of the chemical behavior of vitamin B_2 showed that it withstands rather drastic treatment with acids and alkalies, no appreciable destruction occurring when either a yeast extract or brewer's yeast is hydrolyzed with from 10 to 15 per cent of sulfuric acid or hydrochloric acid at the boiling point for 24 hours or with from 10 to 15 per cent barium hydroxide in the autoclave at from 110 to 120° C. for from 1 to 3 hours. The active factor is apparently stable to hydrogen peroxide, as no loss in activity occurred when the lead acetate precipitate after removal of the lead was heated with excess hydrogen peroxide on the water bath at from 60 to 70° for 30 minutes.

Treatment with nitrous acid also brought about no appreciable destruction of the vitamin. This is in contradiction to the conclusions of Levene (E. S. R., 60, p. 690) and in confirmation of the more recent observations of Chick (E. S. R., 61, p. 711). The vitamin was not appreciably soluble in butyl alcohol.

Vitamin B_2, P. A. LEVENE (*Science, 71 (1930), No. 1852, p. 668*).—An effective method of separating vitamin B_2 from B_1 is described briefly as follows:

"Fraction B_1 is adsorbed on silica gel at pH 3. The filtrate is rich in vitamin B_2, but still contains some vitamin B_1. By precipitation with acetone a material is obtained of which daily doses of 0.015 gm. in addition to 0.0002 gm. of B_1, both added to the standard diet, suffice to maintain normal growth of white rats. By repeating the extraction six times, a material is obtained from the filtrate of which daily doses of 0.005 gm. are required. Finally, when this material is dissolved in water and precipitated with alcohol containing 1 per cent of hydriodic acid, a material is obtained of which daily doses of 0.0007 gm. suffice to maintain normal growth of white rats."

Heat-stability of the (anti-dermatitis, "anti-pellagra") water-soluble vitamin B_2, H. CHICK and M. H. ROSCOE (*Biochem. Jour., 24 (1930), No. 1, pp. 105–112*).—Determinations of the heat stability of vitamin B_2 at varying H-ion concentrations under more exact conditions than in the investigation noted previously (E. S. R., 57, p. 789) are reported and discussed, with particular reference to the alleged discovery by Reader (E. S. R., 62, p. 589) of a new thermolabile vitamin of the B group.

Washed pressed brewer's yeast was used as the source of B_2 in the first series of experiments, but evidence of the formation of toxic substances in the yeast during heating, especially when the reaction was alkaline, led to the use in the second series of experiments of the first extract obtained from yeast in the preparation of the Peters antineuritic concentrate (E. S. R., 52, p. 462). The method of testing for vitamin B_2 was that previously described (E. S. R., 60, p. 690), as modified by Aykroyd and Roscoe (E. S. R., 62, p. 194). The results obtained are summarized as follows:

"At pH 5.0 no loss in vitamin B_2 potency could be detected on heating yeast for 2 hours at 90–100°; about 50 per cent was lost on heating the yeast for 4–5 hours at 123°; at pH 3.0 the loss was the same both with yeast and yeast extract. When the reaction was alkaline (pH 10–9.5) about 30 per cent of the vitamin B_2 originally contained in the yeast extract was lost in 10 days at room temperature (summer); on heating for 2 hours at 98–100° (pH 8.3) the loss was about 50 per cent; and on autoclaving for 4–5 hours at 122–125° (pH 8.3–10) between 75 per cent and 100 per cent."

This sensitiveness of vitamin B_2 to high temperatures in alkaline solution is thought to suggest the possibility that in the experiments of Reader the effects interpreted as due to a deficiency in the new vitamin B_3 might have been caused by an insufficiency of vitamin B_2.

The theory and technique of quantitative analysis, M. Farnsworth (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. VII+154, figs. 34*).—"Procedures may be obtained from books but are valueless unless first of all subjected to searching analysis. . . . But every procedure is a succession of methods—precipitation, filtration, titration, etc.—which must themselves be analyzed. Such is the purpose of this book, the critical analysis of the methods on which all procedures are based."

The following chapters develop the subject with the purpose indicated always kept in view: The balance; precision of measurement; laboratory ware; reagents and their purification; preparing the sample for analysis; precipitation—factors bearing on the purity of the precipitate; filtration; water of crystallization, drying, and drying agents; volumetric analysis; acidimetry and alkalimetry; preparation of standard acid and alkali solutions; precipitimetry; oxidation and reduction; electrolytic processes; and electrometric titrations.

Atomic analysis by X-ray spectroscopy, T. H. Laby (*Faraday Soc. Trans., 26 (1930), No. 8, pp. 497–509, pls. 2, fig. 1*).—The X-ray method for the quantitative determination of certain of the metallic elements by the measurement of the relative intensity of suitable lines of the emission spectra is considered to be at once less limited and more sensitive than is the corresponding method dependent on the lines of the visible spectrum. It is stated that "the X-ray method is capable of the following applications: (1) Analysis of chemically similar elements, e. g., rare earths, platinum metals; (2) in the study of the effect of impurities on the physical properties of metals; (3) in geochemistry."

Visual conductivity titration, G. Jander and O. Pfundt (*Die Visuelle Leitfähigkeitstitration. Stuttgart: Ferdinand Enke, 1929, pp. VIII+64, figs. 36*).—This is the twenty-sixth of a series edited by B. M. Margosches (E. S. R., 57, p. 204). The main part of the monograph presents the theory of conductivity titration, general considerations on conductivity and its measurement, the visual method, general notes, and examples, followed by an appendix, notes, and a brief subject index.

The determination of potassium in soil samples by the application of an X-ray method, J. T. Calvert (*Faraday Soc. Trans., 26 (1930), No. 8, pp 509–514, fig. 1*).—"The underlying principle of quantitative X-ray analysis is that the intensity of an X-ray line emitted by an element is proportional to the atomic concentration of the element in the sample under investigation. The absolute intensity, however, is to a high degree dependent upon the composition of the sample, and it is therefore necessary to add a reference substance. Then instead of measuring the absolute intensity of the line of the element to be determined, it is possible to consider the intensity ratio between the latter and the line of the added reference substance."

On this basis the potassium content of soils and of some minerals was found determinable with the use of manganese as reference element. "The method consists of mixing a known quantity of manganese oxide to the soil sample and comparing the intensities of the potassium $K\alpha_1$ and the manganese $K\beta_1$ lines excited by X-rays of shorter wave length."

A practical method for fat determination in milk, B. Singh (*Jour. Cent. Bur. Anim. Husb. and Dairying, India, 3 (1929), No. 3, p. 76*).—Because the method previously noted (E. S. R., 62, p. 408) did not give good results in the hands of an unskilled worker, the following changes in method are recommended: 17.6 cc. of milk, 5 cc. of Fehling B, and 2 cc. of alcohol mixture (4 parts of methyl and 1 part of amyl alcohol) are placed in a Babcock test bottle in the order named and mixed. The bottle is placed in hot water at 80° C. and shaken every minute until the liquid inside is red. The bottle is then taken out, shaken thoroughly, and replaced in the same water. After about 3 minutes the fat begins to float in a clear layer on the top. Hot water is added slowly with a pipette until the fat column rises in the neck, and the bottle is then twirled between the palms of the hands to free any fat globules from the lower solution. Reading is done from the lower level of the meniscus at both top and bottom when the bottle is slightly cool. Except for the first 5 minutes, the water bath need not be kept at 80°.

A report of the National Research Council Committee on the construction and equipment of chemical laboratories (*New York: Chem. Found., Inc., 1930, pp. XIII+340, figs. 125*).—This report contains a foreword by G. L. Coyle, and the following chapters by the authors respectively indicated:

The planning of a chemical laboratory, by J. N. Swan and G. L. Coyle; arrangement of interiors and types of buildings, by J. N. Swan; location and exterior construction, general ventilation and heating, hood ventilation, lighting, plumbing, and electrical equipment, all by C. R. Hoover; laboratory tables, service and storage rooms, lecture rooms, classrooms, library, and museum, and offices and private laboratories, all by J. N. Swan; laboratories for general chemistry—high school laboratories for chemistry, by L. W. Mattern, small high schools, by G. L. Coyle, and college laboratories for general chemistry, by J. N. Swan; laboratories for analytical chemistry—qualitative and quantitative analysis laboratories, by J. N. Swan, and a laboratory for gas analysis, by M. L. Nichols; laboratories for organic chemistry, by G. H. Woollett; laboratories for physical and electrochemistry, by V. A. Coulter; special laboratories—laboratories for chemical microscopy, by E. M. Chamot, a laboratory for chemical spectroscopy, by J. Papish, and other special rooms, by J. N. Swan; the design of laboratories for instruction in industrial chemistry—the unit process method, by F. H. Rhodes, and the unit plant method, by A. Rogers; industrial chemical laboratories, by A. V. H. Mory; laboratories for biochemical teaching, by C. P. Sherwin; and sanitary and biological research laboratories, by A. B. Wadsworth.

METEOROLOGY

Weather recurrences and weather cycles, R. Gregory (*Quart. Jour. Roy. Met. Soc. [London], 56 (1930), No. 234, pp. 103–120, figs. 2; abs. in Nature [London], 125 (1930), No. 3143, pp. 132–134, fig. 1; Sci. Abs., Sect. A—Phys., 33*

(1930), No. 390, p. 558).—The author discusses various weather cycles, but especially that of Brückner. He shows that the latter is of less importance in Great Britain than one of 50 years, being "useless for the purpose of making long-range forecasts of weather. . . . The true value of Brückner's work lies in a different direction. Although the amount of rainfall may vary widely from one year to the next, the quantity of water which is stored up on the land areas, in the soil, in lakes, and in glaciers, varies far more slowly. This stored water is not so closely related to the rainfall of the 1 preceding year as to the average rainfall of the 10 preceding years, and if these 10 years fall in the wet half of a Brückner cycle, the quantity of stored water will be great. Again, in the dull rainy countries of northwest Europe, warm dry years are favorable for crops and vegetation, and on the whole the dry warm half of a Brückner cycle will yield better crops than the cool wet half, although there may be wide variations from one year to the next."

It is pointed out that attempts to correlate weather cycles with crops have given discordant results. "The best work has been done by a direct study of the relations between variations of weather and subsequent variations of crops. . . . The methods now adopted at the Rothamsted Experimental Station for all accurate field experiments make it possible to discover with considerable precision the influence on crop yields of rain, temperature, sunshine, or any other meteorological factor that can be measured and expressed in figures."

The chief conclusion reached is that weather cycles "are either indefinite or if they are expressed precisely they usually break down when tested over long periods."

Climate and Soil in their effect on plant life, H. Lundegårdh *(Klima und Boden in Ihrer Wirkung auf das Pflanzenleben. Jena: Gustav Fischer, 1930, 2. rev. ed., pp. X+480, pls. 2, figs. 129).*—This is a revision of the first edition of this book, previously noted (E. S. R., 55, p. 811), taking account especially of recent progress in experimental ecology, soil science, microbiology, and plant physiology as related to climate and soils.

The farming system and the climate, J. Neuhaus *(Das Betriebssystem und das Klima. Diss., Hellischen Ludwigs-Univ., Giessen, 1929, pp. 135, figs. 27).*—This doctor's thesis discusses the relation of climate to soils and farming systems and methods in Germany and indicates how the climatic conditions may be utilized to better advantage by more attention to choice of crops and cropping systems and methods of culture. A considerable bibliography is appended.

A new rain chart of the world [trans. title], E. Ekhart *(Petermanns Mitt. Justus Perthes' Geogr. Anst., 76 (1930), No. 3–4, pp. 57–64, pls. 2, fig. 1).*—This chart is based on 10-year averages of rainfall for the same period, 1911–1920, at 500 stations in different parts of the world.

Rainfall in New England, X. H. Goodnough *(Jour. New England Water Works Assoc., 44 (1930), No. 2, pp. 157–351).*—This paper summarizes by months and years, up to the end of 1928, the available reliable records of rainfall at various places in New England, including some records extending over a period of more than 100 years.

Meteorological observations, [July–August, 1930], C. I. Gunness and F. R. Shaw *(Massachusetts Sta. Met. Ser. Buls. 499–500 (1930), pp. 4 each).*—Observations at Amherst, Mass., are summarized and briefly commented upon.

SOILS—FERTILIZERS

Textbook of general soil science, A. Stebutt *(Lehrbuch der Allgemeinen Bodenkunde, Berlin: Borntraeger Bros., 1930, pp. XII+518, figs. 55).*—The author describes this book as a text containing a systematic development of that viewpoint which looks upon the soil as a natural formation dynamically conditioned and in process, therefore, of continuous development and evolution. It is, therefore, what may be translated as "fundamentally a theory of the soil as a dynamic system." The four sections, each divided into numerous chapters and subheadings, are (1) the soil forming substrate, (2) soil dynamics, (3) soil genetics, and (4) the theory of soil fertility.

On the characteristics of "terra rossa" from the vicinity of Rome [trans. title], B. Filosofov (In *Pami͡ati K. D. Glinki* [*K. D. Glinka: A Memorial*]. *Leningrad: Selsk. Khoz. Inst., 1928, pp. 191–207, pl. 1*).—After reviewing the various theories on the origin and formation of the red soils in southern Europe, the author presents chemical and mineralogical analyses of the samples of parent material and their weathered products from an extinct volcano in the vicinity of Rome. The parent rock was found to be crystalline, gray in color, and somewhat porous, and contained white grains of leucite and black crystals of pyroxene.

Under the microscope the ground mass showed an andesitic structure, consisting of microlites saturated with glass, among which grains resembling magnetite could be found. Large concretions of diopside were also found. The following analyses show the difference in chemical composition of the native rock and weathered material of one of the samples: Hygroscopic moisture 1.17 and 8.7 per cent, silicic acid 47.93 and 43.2, alumina 14.85 and 19.46, iron 5.32 and 7.21, manganese oxide 0.27 and 0.30, magnesium oxide 8.18 and 9.08, calcium oxide 12.66 and 11.74, potassium oxide 5.59 and 0.51, sodium oxide 2.15 and 1.41, carbon dioxide 0.0 and 0.01, water 1.28 and 4.42, and organic substance 0.0 and 0.55 per cent. From the analyses presented the author concludes that the weathering in the region of the Mediterranean is similar to that of laterititization in the Tropics. The presence of free hydrates of aluminum is noted as another indication of the similarity. The intensity of the red color is considered to be determined by the presence of calcium, but its presence was found not a necessary attribute of the formation of terra rossa.

Contribution to the study of the physical properties of chestnut soils in various states of cultivation [trans. title], V. S. Bystrov (*Zuhr. Opytn. Agron. I͡ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *6* (*1928*), *No. 1, pp. 133–153, figs. 3*).—With the aid of the Doi͡arenko-Nekrasov apparatus borings were made on different types of sod, cultivated soil, and fallow, and determinations were made of the moisture content, the degree of aeration, the total porosity, the capillary porosity, the noncapillary porosity, and the total moisture-holding capacity. Ten samples were taken during the season to a depth of from 0 to 20 cm.

The moisture content was highest in the fallow, lowest in the sod. The fallow had the highest total and the lowest capillary porosity; also the highest aeration and moisture-holding capacity. The differently tilled plats did not vary in this respect. In general plowed up sod, stubble fields, and cultivated land differed little in the physical properties mentioned. Among the fallows, the late one and that planted with corn contained less noncapillary moisture.

In addition to the physical properties, the author investigated also the nitrate content in all the samples. No relation was found as between the nitrate content and the physical properties. The fallow plat contained the most nitrate. Plowed up sod and cultivated fields showed no variation in nitrate content.

The characteristics of the soils from the experiment stations in the nonchernozem belt of the Russian Socialist Federal Soviet Republic in con-

nection with liming experiments [trans. title], D. V. DRUZHININ and N. E. KARGOPOL'TSEV (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*]), *No. 61* (*1929*), *pp. 28–34*).—Analyses of soils from 13 experiment stations engaged in a cooperative liming experiment brought out the following characteristics of these soils:

The soils could be divided according to their degree of unsaturation into (1) soils highly unsaturated with respect to bases, (2) medium, and (3) slightly unsaturated soils. There was found a more or less direct relation between the degree of unsaturation, the relative value of exchange acidity, the active reaction, and the influence of lime on the shifting of the pH values, as well as the crop yield. The influence of lime on the forms of acidity in podzolized soils was not of significance sufficient to interpret data on liming.

Residual water and maximum hygroscopicity in southern chernozem on the plats of the meteorological division of the experiment station [trans. title], R. Ė. DAVID and S. Z. MIROSHKIN (*Zhur. Opytn. Agron. Iugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *6* (*1928*), *No. 1, pp. 129–132*).—Parallel observations and determinations were made (1) on the so-called residual water in the soil in dry years after the harvest when the plants were suffering for lack of water at the end of the growth period, and (2) on the maximum of hygroscopicity of the soil by laboratory methods. The data presented led to the following conclusions: (1) The plat where the snow was retained had the greater proportion of physiologically unavailable water through the depth of 110 cm. (43.3 in.). (2) The curve of the maximum hygroscopicity shows no definite relation with the genetic horizons. (3) The ratio of the residual moisture to the maximum hygroscopicity, to the depth of effervescence, is about 2.17:2.26 under normal conditions of snowfall. In the deeper layers the ratio widens; their water content was not utilized by the plants. The residual moisture in dry years was taken for the particular soils as the limit of moisture which the plants could use. Twice the maximum hygroscopicity was taken as the measure of the soil moisture not accessible to plants.

The characteristic of the leached horizon of a forest podzolized soil and its relation to the morphologic podzolized horizon [trans. title], A. PRONEVICH (In *Pamíāti K. D. Glinki* [*K. D. Glinka: A Memorial*]. *Leningrad: Selsk. Khoz. Inst., 1928, pp. 163–190, figs. 3*).—On a profile of podzolized soil, studied in great detail, two variations of formations were noted, (1) a leached horizon and (2) morphologic soil horizons (A_1, A_2, and B). The leached horizon forms under the influence of factors which act unceasingly in one and the same direction. This horizon has a different relation to the relief and the prevailing soil forming processes than the horizon of group 2. The morphologic horizons (A_1, A_2, and B) belong to the group of soil formations which are in a dynamic equilibrim with present-day conditions, especially with the "biological cover." With every new equilibrim established between the ground waters and the surface biologic cover these formations (A_1, A_2, and B) change their outer appearance. The character of the leached horizon of a podzolized soil may give some idea about the evolution of the soil. Since the soils studied were of the marshy type, their drying produced conditions under which the upper organic layers dissolve out leaving behind a white infertile residue. This may be prevented by using lime during the drying, whereby the humus colloids are coagulated and prevented from washing down.

Effect of the drying and heating of agricultural soils on their content of water-soluble phosphoric acid [trans. title), A. T. SCHLOESING and D. LEROUX (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 11, pp. 649–652*).—A series of experiments by Lebediantzeff (E. S. R., 51, p. 415; 53, p. 419; 54,

p. 118) has recently shown that increase of productiveness followed the drying, and particularly the repeated drying, of certain Russian soils.

It was previously found by Schloesing in experimentation, some of which has been noted (E. S. R., 10, pp. 714, 936; 14, pp. 233, 341; 15, p. 760), that certain substances even when present in very small proportions or when but very slightly dissolved, as in the case of phosphoric acid, may increase crop yields considerably.

The present account shows tabulations of tests which indicate that P_2O_5 is recoverable by solution from dried soils in sensibly larger proportions than from nondried soils. It is thought that during the heating and drying of the soils the amount of phosphoric acid which is soluble, and hence available to plants, is sensibly and sometimes significantly increased.

Concerning the absorbing force of soils [trans. title], N. M. Trofimov (*Vestnik Irrigatsii, 7 (1929), No. 5, pp. 87–99, figs. 5*).—The author discusses (1) the absorbing power of porous bodies and soils, citing the work of Jamén and Wollny; (2) the forms of soil moisture—maximum hygroscopic moisture holding capacity, coefficient of wilting, maximum molecular moisture holding capacity, complete saturation, capillary moisture holding capacity, and gravitational water; and (3) the absorbing force of soils and methods of determining it.

On the problem of the accuracy of soil moisture determinations [trans. title], D. S. Kuznetsov (*Zhur. Opytn. Agron. I͡ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *6* (*1928*), *No. 1, pp. 155–180, figs. 2*).—The author presents the results of a mathematical treatment of data on the moisture of a soil under sunflowers. The moisture content was determined on each 10-cm. layer to a depth of 200 cm. For each layer eight borings were made, so that each plat gave 160 determinations.

The first problem investigated was whether the genetic horizons in the soil investigated influence the moisture content. It was found that for this soil this was not the case, and from a mathematical point of view it was more rational to determine the moisture on each 10-cm. layer. A sharp break in the moisture content and its constancy could be noted at a depth of 100 cm., that is, the moisture content was more constant in the 10-cm. layers from 0 to 100 than from 100 to 200 cm. From the methodological viewpoint it was found important to note the presence of a correlation between corresponding values of moisture in two different 10-cm. layers on the one hand and two different borings on the other. The correlation value of the moisture in two borings was found to be determined by the distance between them. The character of the change in the accuracy of individual measurements of moisture within the meter layers (0–100, 100–200 cm.) or of independent experiments was analogous to the character of the change in the constancy of the moisture, both the accuracy and constancy being measured by the same mean quadratic departure.

An experiment to determine the effectiveness of the soil nutrients in soil layers at various depths [trans. title], J. Souček (*Listy Cukrovar., 48* (*1930*), *No. 22, pp. 243–248, figs. 4; Ger. trans. in Ztschr. Zuckerindus. Čechoslovak. Repub., 54* (*1930*), *No. 25, pp. 284–288, figs. 4*).—It was found that the nutrients present in the lower layers of the soil surface became fully effective only when the working of the soil had brought these lower layers to the surface. It is considered, however, that this conclusion does not apply with equal force to plants of all types of root system.

The investigation of the soil protozoa [trans. title], T. V. and M. P. Vinogradovy (In *Pamíàti K. D. Glinki* [*K. D. Glinka: A Memorial*]. *Leningrad:*

Selsk. Khoz. Inst., 1928, pp. 209–218).—The following conclusions were drawn from the work reported:

Soil from the vicinity of Leningrad was found to be very poor in protozoa. The depth distribution of protozoa in the soil depends on the morphological character of the soil. In high-clay, small-grained soils protozoa were found in the upper part of horizon A_1. Prolonged drying at room temperature killed most of the protozoa, as did also low temperatures. Heat and cold destroyed not only the active but also the cysted forms of protozoa.

Use of the microscope in studying the activities of bacteria in soil, H. J. Conn (*Jour. Bact., 17 (1929), No. 6, pp. 399–405, figs. 2*).—A contribution from the New York State Experiment Station, this paper describes a technic for the study of the development of bacterial inocula in sterilized soils.

Pass the nearly air-dried soil sample through a sieve of about 2 mm. aperture, spray into the sifted soil water sufficient to render it moist but not enough to make the material inconvenient for handling, and store the sample in stoppered bottles. For use, sterilize 10-gm. samples in cotton-plugged test tubes of a diameter of about 18 to 20 mm. by subjecting the tubes to 1 atmosphere pressure for 30 minutes in an autoclave.

Add the nutrients to be studied in the approximate proportion of 1 gm. in each 100 gm. of the soil, and inoculate from 24-hour agar cultures, rubbing the growth into suspension in sterile distilled water and transferring aseptically 1 cc. of the inoculum thus prepared to each tube. Examine the soil cultures at suitable intervals by means of the Conn gelatin film method (E. S. R., 60, p. 20), using as a stain rose bengal 1 gm., calcium chloride 0.01 gm., dissolved in 5 per cent aqueous phenol 100 cc. Examine the dried film under high (immersion) magnification.

By use of such a procedure the author showed the failure of *Bacterium globiforme* (E. S. R., 60, p. 420) to develop in sterilized Volusia silt loam in the absence of supplementary nutrients and the vigorous growth of the same organism in the same soil type after the addition of 1 gm. each of ammonium sulfate and glucose to each 100 gm. of the soil. Further, "the investigation has shown that this organism has a wide choice among carbon and nitrogen sources and can employ carbon compounds as simple in composition as acetic acid."

With respect to the technic itself, it is also noted that "the real value of the microscopic method in the physiological study of soil bacteria is that it furnishes a rapid means of determining whether or not an organism is growing in a given soil sample."

The influence of straw on the yield [trans. title], **A. I. Dushechkin** (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*]), *No. 61 (1929), p. 106*).—An experiment with straw alone and in combination with barnyard manure and other mineral fertilizers for wheat on a loam soil of loessial origin is reported. The best results were obtained with straw and a complete mineral fertilizer.

Experiments according to the method of Mitscherlich on various crop plants [trans. title], **J. Pázler** (*Listy Cukrovar., 48 (1930), No. 21, pp. 225–234, figs. 15; Ger. trans. in Ztschr. Zuckerindus. Čechoslovak. Repub., 54 (1930), No. 25, pp. 273–283, figs. 15*).—Different plants gave different indications with respect to the available nitrogen, potash, and phosphate contents of the soil. The experiments are considered to have laid a foundation for further work to determine whether the discrepancies in the determination of soil nutrients by various groups resulted from an effect of these nutrients varying with the different plants, or whether the variation is due to differing ability among these plants to secure the nutrients from the soil.

[Soil investigations and lime and fertilizer tests] (*Missouri Sta. Bul. 285 (1930), pp. 101–114, figs. 7*).—The report contains the following items on these subjects:

The electrodialysis of colloidal clay, R. Bradfield, H. Jenny, and L. D. Baver.—Having observed previously (E. S. R., 60, p. 509) the removal by electrodialysis of a total quantity of anions proportionately very small, the investigators of this problem now find further that "when electrodialyzed clays were treated with known amounts of salts like Na_2HPO_4 it was found that the complete recovery of the phosphate by electrodialysis was very slow. The samples continued to yield anions in small quantities for several weeks. The rate of removal of anions was increased by keeping the clay neutral or slightly alkaline in reaction. The use of positively charged anode membrane, which was found of great importance in earlier work with pure salts and protein solutions, was of much less value when used with clays. A layer of the negatively charged clay was deposited on the inside of the positive anode membrane and converted it into a negative membrane. No satisfactory method of circumventing this difficulty has been found."

Saturation capacity of colloidal clay, R. Bradfield, H. Jenny, and L. D. Baver.—The experiments on this subject indicated that the absorption of cations continued after the inflection point of the titration curve in the case of strongly alkaline solutions but was of a type different from that observed up to the point of inflection. "It was found possible to shift this inflection point by the addition of neutral salts. This seemed to indicate that the type of alkali binding in the alkaline zone differed from that in the acid zone in degree only. Therefore, the saturation capacity was a relative value. The experimental conditions had to be carefully defined in its determination if comparative values were to be obtained."

The reaction of acid clays with salts, R. Bradfield, H. Jenny, and L. D. Baver.—Electrodialyzed bentonite was treated with various concentrations of several sodium salts. After establishment of equilibrium the clay was separated either by centrifuging or by ultrafiltration. The acid in the colloid free extract was determined by titration, and the pH value was measured by means of the quinhydrone electrode. The pH value of the clear liquid in these cases was found identical with that of the clay suspension. The apparent dissociation constant of the clay was determined from titration curves. The quantities of acid liberated from the various salt solutions was calculated. In the case of the weaker acids, acetic, lactic, monochloracetic, etc., a very satisfactory agreement between calculated and experimental values was found. "The reaction with salts of the stronger acids resulted in very low pH values, and much aluminum hydroxide appeared in solution.

"These results indicated that there was no adequate justification for the division of soil acidity into different classes on the basis of their reactions of different salts."

The effect of different cations on the physical properties of colloidal clays, L. D. Baver.—Putnam colloidal clay, saturated with hydrogen by electrodialysis was brought to various degrees of saturation with lithium, potassium, sodium, calcium, and magnesium by treatment with the corresponding hydroxides, and determinations were made of the viscosity, conductivity, cataphoretic velocity, average particle size, and ultrafiltration velocity. Results are stated, and it is noted especially that "colloidal clay when saturated with calcium formed a larger, less hydrated particle than when saturated with a monovalent cation. This offers ample scientific justification for the use of lime in order to maintain a good soil structure."

The calcium content of soils and its relation to acidity and the response of soils to liming, R. Bradfield.—The Comber lime requirement determination failed to give results as satisfactory as those of a routine laboratory method "where fairly accurate results are desired."

The availability of calcium appeared to increase with the percentage of saturation of the exchange complex with calcium.

It was found possible to determine the saturation capacity from the result of treating the soil with excess ammonium hydroxide, evaporating to dryness, treating the saturated soil with excess of 0.1 N hydrochloric acid, and titrating the excess acid with 0.1 N sodium hydroxide.

Fineness of grinding limestone and the method of applying limestone to Missouri soils, W. A. Albrecht.—Small quantities of fine lime drilled with red or sweetclover increased nodule development of the young plants, improved the stand, and, on very sour soil, increased the crop, either in untilled burned-over prairie or in tilled soil.

Nitrate production by soils, W. A. Albrecht.—Both lime and commercial fertilizer benefited nitrification. Nitrification increased with the addition of nitrogenous organic material, especially when lime also was added.

Methods of improving the tight clay layer in the soils of the level prairies of Missouri, R. Bradfield.—Limestone, gypsum, rock phosphate, and sulfur in varying proportions were applied to the heavy clay layer 22 in. deep with a view to promoting direct flocculating action and the deeper rooting of sweetclover. A different type of rooting system developed, but the roots were confined almost exclusively to the surface 6 or 7 in.

Soil management and fertilizer experiments, M. F. Miller and H. H. Krusekopf.—Results of fertilizer tests of local importance are given.

Erosion of Missouri soils, M. F. Miller and H. H. Krusekopf.—A relation of total rainfall to erosion as definite as was expected could not be determined. The number of "torrential" rains (more than 2 in.) in a month or a season showed itself the important rainfall factor. A graph indicates the last-named relation on the basis of an 11-year average. On a moderate slope a good rotation showed itself capable of preventing the more serious erosion; but corn following corn lost 2.5 times as much soil as corn following clover sod. Soybeans had to be drilled solid, since, in rows "the soybeans allowed almost as much erosion as corn."

Longevity of Bacillus radicicola in the soil, W. A. Albrecht and L. W. Turk.—Experiments on the effect of ultra-violet light stronger than that contained in sunlight yielded the result that "*B. radicicola* remained viable in soil layers (sifted through a 40-mesh screen) $\frac{1}{16}$ in. deep after 4 hours' exposure to the ultra-violet lamp at a distance of 24 cm. The bacteria in water were killed during a 6-minute exposure, and on agar, during a 10-minute exposure. Cultures within the ordinary glass bottles were not killed during a 2-hour exposure. Thus the use of infected soil as inoculation for new fields presented no serious difficulties through exposing the soil to sunlight."

The accumulation or depletion of nitrogen and carbon in soils under different systems of soil treatment and management, M. F. Miller, H. H. Krusekopf, and W. A. Albrecht.—The relation of climatic factors to nitrogen maintenance was found to be such that "the mean annual temperature was a most important factor in controlling the state of equilibrium of soil nitrogen level throughout the humid region. The average nitrogen content of the surface soil increased rapidly with the decrease in the mean annual temperature. . . . The most important problem in handling nitrogen is to provide a reasonable amount of available nitrogen from rotation to rotation as a so-called 'nitrogen turnover,' and not to provide for the maintenance of the total nitrogen of the soil at any particular level. Legumes in the cropping system, the use of animal manures, and the application of nitrogenous fertilizers accomplish this purpose."

Soils of Blaine County, L. F. Gieseker (*Montana Sta. Bul. 228 (1930), pp. 64, pls. 4, fig. 1*).—The report here made is that of a reconnaissance survey carried out by the State Soil Survey, cooperating with the U. S. D. A. Bureau of Chemistry and Soils.

Blaine County occupies an area of 4,229 sq. miles in the north-central part of Montana. The greater part of this area lies in the glaciated portion of the Great Plains region, the topographic features covering a wide range of variation. The Milk River drains the northern and the Missouri River the southern part of the county.

Scobey loam and Phillips loam are the most extensive types among the 15 here classified as 12 series, occupying, respectively, 26.8 and 18.5 per cent of the area surveyed. A mountainous area was found to contribute 5.9 per cent of rough stony land, and 4.1 per cent is listed as "bad lands."

Mineral fertilizers for crops in experiments of 1927 [trans. title], I. E. Lapovk (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*]), *No. 61* (*1929*), *pp. 89–91*).—On a moderately podzolized loam, phosphates were beneficial to flax, increasing the yield of both the seed and straw. The enriched phosphates (precipitated phosphates and double superphosphate) were more effective than superphosphate or the raw phosphate. Of the potassium fertilizers for flax the sulfate proved best. All forms of nitrogen when mixed with potassium and phosphorus increased the yield of flax.

For hemp, Thomas slag with ammonium sulfate was the best combination, with some potassium fertilizers. Potassium in the form of the chloride or as sylvite with sodium nitrate reacted beneficially, but an increase in potassium fertilizers required a corresponding increase of nitrogen fertilizers for the best results.

Sunflowers responded to phosphate treatment on soils of the northern chernozem type, but not on soils south of this region. Neither was there any response to nitrogen and potassium fertilizers in the soils south of the northern chernozem type.

Mustard responded very markedly even on the southern chernozem, but no such response was apparent with soybeans. Tobacco responded to nitrogen fertilizers on the podzolized loams, but less on the chernozem.

Experiments with Solikamsk potassium salts in 1927 [trans. title], D. V. Druzhinin (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*]), *No. 61* (*1929*), *pp. 71–88*).—Summarizing the experiments with the Solikamsk salts (a mixture of potassium chloride and sodium chloride) on various soils, the author states that the salts acted beneficially on sugar beets, barley, lupines, and in some cases on flax when the other fertilizing elements nitrogen and phosphorus were added. These salts compared favorably with the other forms of potassium salts, especially on sugar beets, barley, and potatoes. The introduction of lime in amounts equal to twice the exchange acidity of the soils gave good results. Soils high in hydrogen ions responded very little to potassium fertilizers. The depressing effects of the Solikamsk salts on flax could be traced to the high hydrogen-ion capacity of the soil, with a low base content, and to the large amount of salts necessary to be introduced in the form of the Solikamsk salt for the optimum potassium content, which increased the osmotic pressure of the solution and impeded the growth of the flax. It is thus indicated that podzol soils need liming as well as the introduction of the potassium salts, otherwise the replaced hydrogen ions have a bad effect.

Field experiments with phosphate in 1927 [trans. title], A. N. Lebediantsev (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*]), *No. 61* (*1929*), *pp. 5–21*).—The relative efficiency of raw phosphates compared with superphosphate, with and without other plant foods, was tested on different soils with a variety of crops on the experimental fields of the experiment stations of the respective regions. The raw phosphate was of two grades, one containing 12.79 per cent of phosphoric anhydride ground to a fineness such that 82 per cent of the flour passed a 0.1-mm. sieve, the other containing 16.8 per cent of phosphoric anhydride and so ground that 65.5 per cent passed a sieve of 0.08 mm. or lower. The results of the experiments are presented in a series of tables, and the conclusions are as follows:

In the nonchernozem belt, or, more correctly, in the podzol zone, the raw phosphate on winter crops, in amounts equal to double or triple the quantity of superphosphate—the latter being applied in quantities of 45 kg. of phosphoric anhydride per hectare (40 lbs. per acre)—gave increases in yield as good as those from the superphosphate. No other plant foods were added. The spring crops received, besides the phosphates, some other plant foods, and the increase in yield was slightly greater than with the phosphates alone.

On the chernozem soils the effect of raw phosphate was noted in the zone of degraded chernozem, decreasing in effectiveness as the chernozem was located more to the south or in the drier regions, e. g., in the vicinity of the Volga. Additions of potassium and nitrogen fertilizers to the southern chernozem impeded the slight effects of the phosphates. This was especially true with spring grains.

On the influence of lime in the process of phosphoric acid mobilization in the soil [trans. title], O. K. Kedrov-Zikhman (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*]), *No. 61* (*1929*), *pp. 107, 108*).—Lime was found to release soluble phosphates by virtue of the formation of organic phosphorus compounds easily attacked by microorganisms and thus made available. The calcium replaced the iron and aluminum from their respective phosphates, giving an available calcium phosphate. Caustic lime was more effective in the mobilization of soluble phosphates than was limestone.

Geographic net of experiments on liming in 1926 and 1927 [trans. title], A. P. Levitskiĭ (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*]), *No. 61* (*1929*), *pp. 22–27*).—From a series of experiments with lime (4.5 tons per hectare, or 2 tons per acre), with and without stable manure, on soils of the podzol type and on transition soils located south of the zone of the podzols, it was found that in general winter rye was greatly benefited by liming. This was noted especially in the region of podzolized soils. The effects of liming on the transition soils lying south of the podzols were less marked. The lime influence on the crop following the winter rye, the crop which was limed directly, was more marked. Results from 10 experiment stations showed beneficial residual effects on oats, clover, and potatoes, in each case surpassing the beneficial effects on the crop originally limed. The slow reactivity of the limestone applied seems to have been the cause of the slow effect on the first crop.

Analysis of commercial fertilizers, season 1929–1930, R. N. Brackett and D. H. Henry (*South Carolina Sta. Bul. 267* (*1930*), *pp. 64*).—The routine analyses are accompanied by the usual purchaser's information.

AGRICULTURAL BOTANY

Seasonal variations in the physical and chemical properties of the leaves of the pitch pine, with especial reference to cold resistance, B. S. Meyer (*Amer. Jour. Bot.*, *15* (*1928*), *No. 8*, *pp. 449–472*, *figs. 4*).—A study was made of seasonal variations in the amount of water and sugar obtained under pressure, after various treatments, from the leaves of the pitch pine (*Pinus rigida*), and determinations were made of seasonal variations in the osmotic values of the expressed leaf sap of this species.

The total water content of the mature leaves exhibited no marked variations, though highest in the recently developed leaves during their first summer. The changes that occur are outlined.

The freezing and high-pressure treatment of leaf samples is described as furnishing a relatively simple and adequately quantitative method for distinguishing between bound and free water in leaf tissues. Unfrozen samples resist dehydration more in winter than in summer, a fact contributing evidence as to accumulation of colloidal gels in the leaf cells during the winter. Seasonal variation in the relative proportions of bound and unbound water is considered as the most important factor in the cellular physiology of the leaves of this species in relation to cold resistance. The primary influence of seasonal changes in the amount and condition of the cell colloids is considered as reasonably well established.

The low winter osmotic values so far as obtained would seem to indicate a small influence of this factor in the cold resistance of pitch pine leaves.

The sugar content of the leaves increased during the autumn, stood highest during the winter, decreased in spring, and stood lowest in summer.

The increase in soluble carbohydrates during winter is considered the most important factor causing the increase in the winter osmotic values of the saps. This accumulation of sugars may, it is thought, be of importance also in the cold resistance of pitch pine leaves, due to the protective action which sugars exert against the precipitation of proteins.

The molecular structure of the cell wall of fibers: A summary of X-ray investigations, O. L. Sponsler (*Amer. Jour. Bot., 15 (1928), No. 9, pp. 525–536, figs. 7*).—The recent development of a method of studying atomic and molecular structures based upon the diffraction of X-rays from layers of atoms, particularly in crystalline materials, has been extended to the study of the structure of the less obviously crystalline material of the cell wall, with a view to determine the kind and arrangement of its molecular components. An account of such work is given in the present paper, with resulting details and inferences.

Composition of fungus hyphae.—I, The fusaria, R. C. Thomas (*Amer. Jour. Bot., 15 (1928), No. 9, pp. 537–547*).—Analyses at the Ohio Experiment Station of the composition of the cell walls of 12 different species of Fusarium show the same general plan to hold throughout the group. This plan is described. More detailed study is needed before the probable origin and order of development of the cell wall can be set forth. A striking analogy is pointed out between the structure of the hyphae in Fusarium and that of the apical meristem in the broadbean.

Histogenesis of intumescences in the apple induced by ethylene gas, R. H. Wallace (*Amer. Jour. Bot., 15 (1928), No. 9, pp. 509–524, pls. 2*).—A histological and cytological study as here detailed is said to show that the intumescences which develop in buds and stems of the Transparent apple in response to stimulation by ethylene gas arise through three fundamental changes in the tissues affected, namely, solution of walls, hypertrophy of cells, and proliferation of cells. These are particularized.

Phases of injury to oat plants caused by soil salts [trans. title], R. Schreppe (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1928), No. 1, pp. 169–196, pls. 2*).—Tests were made, each lasting from 4 to 7 days, with oat stalks which had been separated from the roots close to the crown, so as to exclude any possible effect attributable to the roots, and then permitted to take up, through the cut surfaces, solutions of common soil salts, as the carbonates of sodium, potassium, and calcium, and the sulfates of sodium, potassium, and magnesium, at concentrations ranging from 0.05 to 1.3 per cent. The effects are detailed.

Factors affecting the iron and manganese content of plants, with special reference to herbage causing "pining" and "bush-sickness," W. GODDEN and R. E. R. GRIMMETT (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 3, pp. 363–368*).—The pot studies here outlined are admittedly tentative but are expected to lead toward the identification of the pasture herbage factors causing "pining" and "bush sickness" in stock. Specifically, these experiments were designed to test the influence of deficient drainage, of organic matter, of iron, of sulfur, and of lime on the iron and the manganese content of the crop, these factors having been selected in view of the results obtained in the bush-sickness investigations. Details and tabulations are given.

In most cases the iron percentage is higher in the mustard than in the oats, the manganese percentage showing the inverse relation. In the sand cultures the manurial treatment appeared to have had but little effect during the short period of growth, except that sulfur applied either free or as sulfate slightly raised the manganese percentage in the crop.

Drainage conditions, not yet influencing the iron, affected markedly the manganese content of the crop. In the "pining" soil the mustard seedlings failed to grow, and in the limed pot they became markedly chlorotic before dying. The iron content of the oats was fairly uniform throughout the series of pots. Manganese was higher in the undrained pot, but chalk definitely depressed it. Other manurial treatment appeared ineffective toward either iron or manganese.

"The percentages of iron and manganese in the sand, pining soil, and local soil, taken in conjunction with the percentages of these constituents in the oats and mustard grown on these media, suggest that manganese is more easily taken up from the soil by the plant than is iron."

The effect of iodine manuring on the iodine content of plants, J. B. ORR, F. C. KELLY, and G. L. STUART (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 1, pp. 159–161*).—A study was commenced in 1923 at the Rowett Research Institute, Aberdeen, regarding the amount of iodine fixed during growth in food plants, the first trials being with plants in water culture and the second with plants in pots. In each series, employing potassium iodide, the iodine content was increased by iodine manuring, the increase being in proportion to the amount applied. A different outcome by a previous investigator is discussed.

Observations on B. radicicola, Beijk., T. GIBSON (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 1, pp. 76–89, pls. 2*).—Study has been applied to cultures of *Bacillus radicicola* derived from *Trifolium repens*, *T. pratense*, *T. hybridum*, *Medicago sativa*, *Melilotus alba*, *Pisum sativum*, *Vicia sativa*, and *Phaseolus vulgaris*. Each strain after being tested for purity by planting was cultivated on media favorable and unfavorable to growth. A descriptive account is given of the morphology and reproductive processes of the organisms, including rods, coccoids, branched forms, gonidangia, gonidia and dwarfed growth, and microcysts.

The different cell types represent normal stages in the development of the organisms. The reproductive processes described include fission, budding, liberation of gonidia, formation of regenerative bodies, and germination. The formation of symplasm and the regeneration of cells are discussed.

A compendious dictionary of plant names, edited by R. Zander (*Handwörterbuch der Botanischen Pflanzennamen. Berlin: Gärtnerische Verlagsgesell., 1927, pp. 312*).—This booklet of plant names is intended to include the more usual synonyms and German designations for the better known economic plants of agriculture, forestry, and horticulture.

Supplement to a compendious dictionary of plant names, edited by R. Zander (*Nachtrag zum Handwörterbuch der Botanischen Pflanzennamen. Berlin: Gärtnerische Verlagsgesell., 1928, pp. 128*).—This supplement to the above booklet is dated May, 1928.

GENETICS

The biological basis of human nature, H. S. Jennings (*New York: W. W. Norton & Co., 1930, pp. XVIII+384, figs. 51*).—This book deals with the fundamentals of reproduction, inheritance, and evolution as applied to the human race.

The new evolution: Zoogenesis, A. H. Clark (*Baltimore: Williams & Wilkins Co., 1930, pp. XIV+297, figs. 141*).—A treatise on evolution bringing out evidence to indicate the simultaneous development of representatives of practically all the major groups of animals when life first appeared. These have produced new species by specialization or loss of organs through mutation.

Cytological studies in the Betulaceae, III, IV, R. H. Woodworth (*Bot. Gaz., 89 (1930), No. 4, pp. 402–409, pl. 1, figs. 2; 90 (1930), No. 1, pp. 108–115, figs. 34*).—As a further contribution to the general subject (E. S. R., 62, p. 510), two papers are presented.

III. *Parthenogenesis and polyembryony in Alnus rugosa.*—The author reports that in *A. rugosa*, due to irregularities of microsporogenesis, there is practically no perfect pollen formed nor were any pollen tubes seen in the many ovaries examined, yet the plants formed an abundance of viable seed, both naturally and under bags. There was no reduction in chromosome number during macrosporogenesis. Embryos apparently arose from the diploid egg and also by nucellar budding, perhaps also from the synergids, the antipodals, and the endosperm, although the initial stages were not observed. From one to five embryos were found to mature in a single embryo sac. The exhibition of polymorphism, irregular meioses, parthenogenesis, apogamy, nucellar budding, and polyembryony are deemed indicative of hybrid origin.

IV. *Betula, Carpinus, Ostrya, Ostryopsis.*—The author reports that *Betula lutea* from Minnesota was hexaploid like the New England species. *B. papyrifera* had 35 *n* chromosomes, while various subspecies had different multiples of 7. Carpinus, Ostrya, and Ostryopsis had 8 as the basic number of chromosomes. *C. betulus* var. *fastigiata* was octoploid with 32 *n* chromosomes, and *C. cordata* is suspected of being a bigeneric hybrid. The existence of polyploidy and irregular meiosis is cited as evidence that new species in this family may have arisen to a considerable extent by hybridization.

Chromosome numbers in Capsicum, C. L. Huskins and L. La-Cour (*Amer. Nat., 64 (1930), No. 693, pp. 382–384*).—Counts made at the John Innes Horticultural Institution, England, on material from the pollen mother cells of *C. annuum*, *C. baccatum*, and *Solanum capsicastrum* showed 12 to be the basic chromosome number in all three species.

Chromosome numbers in the Cucurbitaceae, J. W. McKay (*Bot. Gaz., 89 (1930), No. 4, pp. 416, 417*).—A tabulation is presented of the results of studies at the University of California on the *n* and 2*n* chromosome counts in a large number of wild and cultivated cucurbits.

Chromosome stability in the genus Rhododendron, K. Sax (*Amer. Jour. Bot., 17 (1930), No. 4, pp. 247–251, pl. 1*).—Chromosome counts at the Arnold Arboretum Laboratory upon material from representative species of Rhododendron showed that 13 is the basic number of chromosomes in the genus, holding true for both the true Rhododendrons and the Azaleas. Two tetraploid species, *R. canadense* and *R. calendulaceum*, were found, but tetraploidy was not considered characteristic of any one subgenus or section. Complete or almost complete compatibility between the parental chromosomes in hybrids between oriental and occidental species is held an indication of the great stability in the genetic constitution of the Rhododendron chromosomes.

A new method of production and detecting sorghum hybrids, G. M. Reed (*Jour. Heredity, 21 (1930), No. 3, pp. 132–144, figs. 7*).—The method outlined provides that the heads of two sorghum varieties, differing in seedling color, as Dawn kafir (green) and Red Amber sorgo (red), be bagged when emerging and before flowers open. When the flowers open pollen from the red seedling parent is shaken over the head of the green seedling parent and the heads rebagged. The operation is repeated and the head of the green seedling parent permitted to mature. If the process is successful germination of the seeds gives two types of seedlings, green from the selfed seed of the mother plant, and red, the F_1 hybrids. A modification of the procedure, also effective, consisted of securing the two heads under the same bag and occasionally shaking the plants thereafter.

F_2 segregation of hybrids in these studies at the Brooklyn Botanical Garden was in about the ratio of 3 red to 1 green seedling. In the F_2 of feterita × Sumac sorgo susceptibility to covered kernel smut seemed dominant, whereas in F_2 of Blackhull kafir × Standard White milo resistance appeared dominant, 3:1 ratios being indicated in both cases.

Vigor in soybeans as affected by hybridity, C. Veatch (*Jour. Amer. Soc. Agron., 22 (1930), No. 4, pp. 289–310, fig. 1*).—The effect of hybridity upon plant development in the soybean was studied into the F_3 generation at the Illinois Experiment Station in hybrids involving 16 varieties or strains.

Among the plant characters studied, seed yield, number of seeds, plant weight, and total stem and branch length seem to be the best criteria of hybrid vigor in soybeans. With increase in seed yield the number of seeds and nodes increased more than the average seed weight or the length of internode. A marked variation was observed in comparative vigor among the different crosses. A higher coefficient was obtained by correlating the characters of the hybrids with the parental average than by correlating with the higher parent, except in days of flowering, where the coefficient was higher when correlating with the late-flowering parents. Transgressive segregation occurred in seed yield, seed number, height of plant, and days from planting to flowering. From the results obtained, hybrid vigor and transgressive segregation were explained by partial dominance of growth factors having a cumulative effect.

Inbreeding: A monographic sketch of its nature and phenomena [trans. title], L. Löhner (*Naturw. u. Landw. [Freising], No. 15 (1929), pp. 146, figs. 27*).—An account of various theories of inbreeding, including some modification in the interpretation.

An experimental study on the effect of thyroxin upon sexual differentiation in the fowl, A. W. Greenwood and A. C. Chaudhuri (*Brit. Jour. Expt. Biol., 5 (1928), No. 4, pp. 378–384*).—From 190 eggs injected with thyroxin at the third day of incubation 39 embryos survived. Of these embryos 12 were markedly affected, as indicated by reduced size resulting from an increase in the metabolic rate following a marked hyperthyroidism, but no influence on sex differentiation was noted.

The iodine content of the thyroid of the fowl with reference to age and sex, A. C. Chaudhuri (*Brit. Jour. Expt. Biol., 5 (1928), No. 4, pp. 366–370*).—Studies of the iodine content of the thyroids of fowls of both sexes and of different ages showed that both the percentage and total amount of iodine increased with age up to maturity. There was no significant difference in the two sexes. The average percentage of iodine found in desiccated thyroids of ducks and fowls was 0.697±0.033, while the average for dogs, goats, and rabbits was 0.215±0.031. The difference of 0.482±0.045 per cent was statistically significant.

The effect of dilution on the activity of spermatozoa, J. Gray (*Brit. Jour. Expt. Biol., 5 (1928), No. 4, pp. 337–344, figs. 4*).—Studies of the motility of spermatozoa of Echinus in different concentrations indicated that crowding in concentrated solutions interfered with motility, and that the greater activity in dilute solutions was not due to the physical or chemical composition of the medium after dilution.

The effect of egg-secretions on the activity of spermatozoa, J. Gray (*Brit. Jour. Expt. Biol., 5 (1928), No. 4, pp. 362–365, figs. 2*).—Secretions of the egg added to sperm suspensions of *Echinus esculentus* increased the rate at which they absorbed oxygen by about 300 per cent, but there was no effect in case of sperm of *E. miliaris*. The respiratory activity remained at a high rate longer in both species when egg secretions were present than when they were absent.

The senescence of spermatozoa, J. Gray (*Brit. Jour. Expt. Biol., 5 (1928), No. 4, pp. 345–361, figs. 3*).—Studies of the oxygen consumption of Echinus sperms showed that in freshly prepared dilute suspensions 1 gm. of cells at 17° C. may consume 8 cc. of oxygen, but the rate of consumption falls so that only 32 cc. of oxygen is consumed during the life of 1 gm. of sperm. Hypotheses to explain senescence of spermatozoa are suggested.

New developments in ovarian dynamics and the law of follicular constancy, A. Lipschutz (*Brit. Jour. Expt. Biol., 5 (1928), No. 4, pp. 283–291, pl. 1*).—Data are reported on the condition of ovarian fragments in fully grown rabbits. In contrast with the findings in case of immature rabbits, no pronounced increase in weight of ovarian fragments followed partial castration in mature does. Partial castration reduced the total number of primary follicles, but the number of large follicles was equal to the number expected in both ovaries. The persistence of mature follicles and formation of follicular cysts was explained as resulting from the disturbed balance between the formation and use of substances necessary for follicular development.

Successful ovarian graft in spayed heifer, C. W. Turner (*Missouri Sta. Bul. 285 (1930), p. 60, fig. 1*).—An account is given of a successful autoplastic ovarian transplantation made in a 6-months-old spayed heifer. At 11 months of age the graft showed definite signs of enlargement and small amounts of mammary secretion were obtained. The secretion of milk increased as time went on, the increases being associated with definite signs of heat.

The length of the oestrous cycle in the unmated normal mouse: Records of one thousand cycles, A. S. Parkes (*Brit. Jour. Expt. Biol., 5 (1928), No. 4, pp. 371–377, figs. 3*).—An analysis of records on the duration of 1,000 oestrous cycles in unmated mice showed the following averages: Whole cycle, 6.213±0.0554 days; dioestrum, including meta-oestrum, 3.719±0.0502 days; and oestrum, including pro-oestrum, 2.494±0.0223 days.

[Studies on reproduction of swine at the Missouri Station] (*Missouri Sta. Bul. 285 (1930), pp. 43–46, figs. 2*).—The results of the following investigations are briefly reported:

Optimum time to breed swine, F. F. McKenzie and J. C. Miller.—To obtain information on this subject sows were bred as they came in heat, 30 hours after the onset of heat, and at the last signs of heat. It appeared that neither the first nor the last time of breeding was the optimum time to mate sows.

The length of the period of heat in gilts and sows and the length of the interval between heat periods, F. F. McKenzie and J. C. Miller.—Observations on the duration of the heat period of 25 Poland China gilts showed that the periods were from 40 to 46 hours long. After weaning their first litters the heat periods were longer, being 65 hours. The interval from the onset of heat until the onset of the next heat period was 21 to 22 days.

Heat and the size of the vulva in swine, F. F. McKenzie and J. C. Miller.—Observations on 25 gilts showed that the vulva began to swell the ninth or tenth day before the onset of heat and increased progressively in size until heat. The swelling subsided in from 8 to 9 days.

The anterior lobe of the pituitary and livestock breeding, F. F. McKenzie.—Implantation of a single anterior lobe of a hog pituitary body in sexually immature rats on each of 4 successive days resulted in material increases in the weight of the ovaries, and brought about ovulation and the formation of corpora lutea. The entire genital tract of the treated animals was also heavier than in controls. The number of corpora lutea in both ovaries reached as high as 60, and in rats implanted with 2 lobes daily for 5 successive days one ovary of one individual contained 74 corpora lutea. One sow, which had never come in heat at 17 months of age, was implanted with 14 fresh pituitaries, and on the seventeenth day a heat period was observed. Twenty-four days later she was bred, after which she farrowed 12 live pigs.

Fertilization in the domestic fowl, D. C. Warren and L. Kilpatrick (*Poultry Sci., 8 (1929), No. 5, pp. 237–256, fig. 1*).—Data are reported on the results of studies at the Kansas Experiment Station of the duration of fertility in the domestic fowl. These data indicated that the freshness of the sperm is an important factor in fertilization. When a hen was mated with one male, and then the male was changed, the offspring sired by the second male very soon supplanted those sired by the first male, with practically no overlapping. Later introduced sperm, however, lost their advantage after they had remained in the oviduct more than one day. This led to a study of the morphological characteristics of fresh sperm and sperm which had remained in the oviduct for definite periods.

These experiments showed that the flagellum was lost during the first day in the oviduct. Thus, old sperm are handicapped by not having an organ of motility to enable them to reach the ovum as quickly as fresh sperm. Eggs were fertilized when laid from 3 to 5 days after the first possible coitus. The average period of fertility after the male was removed was 12.04 days when the intensity of laying was 60 per cent or above, and 10.4 days when it was less than 60 per cent, indicating that the rate of laying does not influence the duration of fertility. Neither sex ratio nor embryonic mortality was influenced by the period of retention of the sperm in the oviduct.

FIELD CROPS

[Field crops experiments in Missouri, 1928–29], W. C. Etheridge, L. J. Stadler, R. T. Kirkpatrick, C. A. Helm, B. M. King, T. J. Talbert, and J. T. Quinn (*Missouri Sta. Bul. 285 (1930), pp. 76–81, 85*).—Breeding work with corn, wheat, oats, and soybeans; variety tests with these crops, cotton, and potatoes; studies of the adaptation and cultural needs of grain sorghum; and a comparison of grain sorghum with corn for grain and forage are reviewed as heretofore (E. S. R., 62, p. 30).

The rate of mutation induced by irradiation was found to be about six times as high in germinating seeds as that in dormant seeds given the same treatment. The mutation rate in seed soaked without aeration resembled that in dormant seeds. Temperature and moisture content had no appreciable effect on the mutation rate, which rose with increased dosage.

Progenies were grown from six ears of corn treated with X-rays at fertilization, and when shedding, the pollen of each plant was examined for semisterility. Semisterile plants were found in each of these cultures, averaging about 6 per cent. All of the plants with partially aborted pollen gave ears indicating partial abortion of the female germ cells also, whether self-pollinated or pollinated by normal stocks. The self-fertilized ears of plants grown from seed treated at fertilization segregated recessive gene mutations comparable to those previously found in barley. Treatment of mature pollen just before pollination resulted in the production of a large proportion of defective and germless seeds. Some of the defective seeds were viable and produced defective plants, the results showing the functioning of defective pollen. In a yield test of hybrids and the better seed stocks of corn available to Missouri farmers in Jackson County the three highest yields were made by hybrids, ranging from 90 to 92.5 bu. per acre, and farm-selected Reid Yellow Dent averaged 72.2 and farm-selected Commercial White 67.7 bu.

Early prolific cottons, as Delfos and Trice, led in yields at Hayti in southeastern Missouri, while Acala was first on sandy land at Kennett. The best spacing at Hayti was 2 to 4 plants in hills 10 to 12 in. apart and at Kennett 1 plant in hills 12 in. apart. At both places fertilizers containing nitrogen and phosphorus gave increases over no treatment.

The Irish Cobbler potato was found superior to the Early Ohio for Missouri conditions. Northern-grown certified seed outyielded and produced a higher percentage of No. 1 potatoes than uncertified seed, although hill-selected fall home-grown seed of Irish Cobbler used as seed for the early crop produced a higher percentage of No. 1 potatoes than the northern-grown certified seed. Early planting gave the largest yield, and April 30 and May 10 plantings were affected badly with hopper-burn. Commercial fertilizer (4–12–4) at the rate of 500 lbs. per acre with barnyard manure gave the largest yield of No. 1 potatoes. No appreciable differences were noted in effects of different mixtures of Bordeaux on the potato plant. However, it appeared that a more dilute solution of Bordeaux may be used in the control of hopper-burn. Bordeaux dust was not as effective as liquid Bordeaux in the control of hopper-burn.

[Agronomic studies in England] (*Jour. Natl. Inst. Agr. Bot., 2 (1930), No. 3, pp. 181–285*).—Investigations with field crops reported on in these pages include trials of spring-sown barleys (1925–1929), reported by S. F. Armstrong; trials of spring-sown oats (1925–1928), by E. G. Thompson; trials of winter and spring wheat, barley, and oats in Essex (1927–28), by F. C. Hawkes; maturity and yield trials of main crop potatoes (1925–1928), by W. H. Parker; and the Lord Derby Gold Medal potato trials (1929), by W. H. Parker and H. Bryan. The report of the Potato Synonym Committee (1929), by R. N. Salaman, is also included.

Effect of soil type and fertilizer on the nitrate content of the expressed sap and the total nitrogen content of the tissue of the small grains, R. L. Cook (*Jour. Amer. Soc. Agron., 22 (1930), No. 5, pp. 393–408, fig. 1*).—Determinations were made at the Michigan Experiment Station of the nitrate content of the sap and the total nitrogen content of the tissue of wheat, oats, barley, and rye plants grown on general fertility plats on Miami loam and Hillsdale sandy loam and on special plats treated with different quantities of sodium nitrate.

Any fertilizer except nitrogen that increased plant growth had a tendency to depress the nitrate content of the expressed sap, whereas nitrogen fertilizers tended to increase the nitrate content of the sap. The total nitrogen content of the dried tissue was found to vary directly with the amount of nitrate in the sap. The stems, as a general rule, contained more nitrate nitrogen in the sap and less total nitrogen in the tissue than did the leaves of the same plants. The size of the plants seemed to make no difference in the proportion of stems to leaves. Spring grains possessed a greater ability to accumulate nitrate in the sap than did the winter grains. Regardless of fertilizer treatment, the total nitrogen in the tissue declined steadily throughout the growing season. The state of fertility of the soil appeared to have a greater effect than soil type on the nitrate content of the sap and the total nitrogen content of the tissue of the small grains.

The influence of the number of nodule bacteria applied to the seed upon nodule formation in legumes, H. G. Thornton (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 2, pp. 373–381, fig. 1*).—A field trial at Rothamsted Experimental Station with alfalfa grown from seed treated with varying doses of culture showed that the numbers of nodules were increased as the dose was raised from 2,500 to 20,000 organisms per seed, i. e., a reduction from 56 to 7 lbs. of seed per culture. Storing the seed for periods up to 28 days between inoculation and sowing caused a loss in the nodule numbers, this loss being greatest between the first and seventh day of storage. The difference in dose of culture and in storage period did not affect significantly the crop obtained from inoculated plats, which greatly exceeded the uninoculated in yield.

In a pot experiment with runner beans an increase in the dose of culture above 1,280,000,000 organisms per pot containing six seeds was found still capable of increasing nodule numbers but not proportional to the increase in dose. Although the experiment did not exclude the possibility that the restriction in effect of very heavy doses may be due to the soil population becoming saturated with the bacteria, observations on alfalfa plants grown aseptically on agar and inoculated with a pure culture revealed that even when excessive numbers of the bacteria immediately surrounded the root hairs only 4 per cent of these were infected.

The canary grasses in New Zealand, H. H. Allan and V. D. Zotov (*New Zeal. Jour. Agr.*, *40* (*1930*), *No. 4, pp. 256–264, figs. 2*).—Species of Phalaris occurring in New Zealand, including *P. arundinacea*, *P. coerulescens*, *P. canariensis*, *P. minor*, and *P. tuberosa*, are described, with a key and remarks on the origin and characteristics of Toowoomba canary grass. This variety and Harding grass are said to be one and the same as *P. tuberosa*.

Relation of organic food reserves to the growth of some Kansas pasture plants, A. E. Aldous (*Jour. Amer. Soc. Agron.*, *22* (*1930*), *No. 5, pp. 385–392*).—Analyses by the Kansas Experiment Station of the organic food reserves in the roots of little bluestem (*Andropogon scoparius*), buckbrush (*Symphoricarpos vulgaris*), sumac (*Rhus glabra*), ironweed (*Vernonia baldwini*), and vervain (*Verbena stricta*) showed that perennial herbaceous plants decrease in organic reserves up to about the time of flower, after which the plants begin to restore the reserves which must have been drawn on to produce the top growth.

In clipping treatments on native sod to simulate different intensities and methods of grazing, it was evident that the amount of food reserves decreased with the frequency of cutting, the greatest amounts being present in the roots of plants uncut or cut less frequently and at the greatest heights. The yield of vegetation from the plats was indirectly proportional to the frequency of cutting. The food reserves appeared to increase with the lengthening of the period of protection, particularly during the beginning of the season. The protection during the latter part of the season apparently was not so helpful.

Cooperative fertilizer experiments with cotton, M. Nelson (*Arkansas Sta. Bul. 255 (1930), pp. 44, figs. 2*).—Cooperative fertilizer experiments with cotton (E. S. R., 53, p. 435) continued in the years 1925 to 1929, inclusive, are summarized for the three major soil divisions of Arkansas and for the State as divided into nine areas. The materials used in the 365 individual tests were sodium nitrate, superphosphate, and potassium chloride.

The response on the three major soil divisions indicated for the hill section a complete fertilizer carrying a good supply of nitrogen and potassium and relatively high in phosphorus. A complete fertilizer, as the 4–10–4 combination used, amply supplied with all three elements appeared suitable for the coastal plains area. The lowland soils resembled those of the other divisions in their response to complete fertilizers, a formula furnishing plenty of phosphorus and potassium and a high percentage of nitrogen appearing well adapted. While nitrogen alone might be used profitably in the lowland section, complete fertilizers gave more consistent returns. The responses of the soils to the single elements are also indicated.

On the basis of nine divisions of the State, the data showed no great variations or marked differences betwen the sections not obvious in the study of the larger divisions. Complete fertilizers consistently gave more profitable results on all the nine areas than did the carriers used separately. On the whole, a border area showed the best responses to fertilizers. An area consisting of lowlands less well drained responded less to fertilizers than the other areas, yet the results were satisfactory.

Quantities of fertilizers ranging from 400 to 600 lbs. per acre appeared to be suitable for most sections of the State. Under favorable conditions a 600-lb. rate gave the highest acre returns and percentage returns only slightly below that of 400 lbs. per acre. The 800-lb. rate used in a few experiments did not appear satisfactory. No soil type, locality, or condition in the State failed to respond satisfactorily to fertilizers for cotton.

Cotton spacing.—II, Effect of seasonal blooming on earliness, fruit set, and yield, J. O. Ware (*Arkansas Sta. Bul. 253 (1930), pp. 64*).—The second number of this series (E. S. R., 60, p. 816) deals with the effects of spacing on seasonal blooming of cotton and the influence of seasonal blooming on fruit set, total production, and earliness, i. e., percentage of crop harvested at the first picking. The data on stand, bloom counts, blooms shed, blooms and bolls per plant, yields of seed cotton, and earliness were taken from the records obtained at Scott from 1922 to 1926, inclusive.

Increase in stand up to an average of 51,000 plants per acre was found to enhance the rate of blooming in the first 3 weeks of the blooming period, resulting in the setting of enough fruit for a crop earlier in the season than with a thin stand. The earlier setting of fruit was shown by a larger first picking in thick stands than in thin stands. The speeding up of seasonal blooming did not always seem to be reflected in increased production. While thick spacing increases the first picking of some varieties more than in others, it does not overcome the lack of productivity in a poorer yielding variety. It was pointed out that if the boll weevil attacks the cotton in midseason or before squares ample for a normal crop are produced, or if other damaging agencies appear in the latter part of the fruiting season, closely spaced cotton will outyield thinly spaced cotton.

With conditions favoring growth and fruit production throughout the growing season, the cotton plant seemed able to adjust itself to a wide range in stand and to make practically the same yields regardless of spacings within the limits of from 10,000 to 50,000 plants per acre. However, if the soil is poor or not fertile enough to produce large plants closer spacing is held necessary. The rows and the stand in the row should be of such width that enough vegetation can be produced on the land to carry an ample crop of bolls. Recommendations were in harmony with those in the earlier report, indicating from 2 to 3 plants a hoe width apart on all lands, with the rows 3.5 to 4 ft. wide on rich land, 3 to 3.5 ft. apart on land of medium fertility, and closer than 3 ft. on poor land.

Biometrical relationships of certain characters in upland cotton, G. N. Stroman (*Jour. Amer. Soc. Agron., 22 (1930), No. 4, pp. 327–340*).—Cotton varieties of the 1928 crop, including Russell Big Boll, Lightning Express, and five strains of Acala, were studied biometrically at the New Mexico Experiment Station.

The characters, including weight of lint per boll, percentage of lint, number of 5-lock bolls, number of 4-lock bolls, number of vegetative branches, number of fruiting branches, and height, gave a uniformly high multiple correlation upon yield for all varieties, running from 0.96 to 0.99. The correlation of seven of these characters upon number of 5-lock bolls ran from 0.94 to 0.99, upon weight per boll from 0.83 to 0.94, and upon number of 4-lock bolls from 0.82 to 0.97. The other multiple correlation coefficients were not so high, and that upon percentage of lint was not significant. Evidently if the above mentioned characters are taken into account in cotton breeding all of the characters associated closely with yield are included.

Yield was made up of number of bolls and weight per boll, and strong partial correlation coefficients were found. However, number of bolls was more closely associated with yield than weight of boll. Usually the varieties having the lowest weight per boll showed the poorest correlation of yield and weight per boll. Weight per boll and 5-lock bolls, as well as weight per boll and 4-lock bolls, were highly negatively correlated. The fact that both 4-lock and 5-lock bolls were correlated with weight of boll shows that number of bolls would be highly correlated with weight of boll. It appeared that a variety producing a high weight per boll and which can bear a large number of bolls should be the aim of the cotton breeder.

The number of 5-lock bolls and number of 4-lock bolls were found to be correlated negatively and 5-lock bolls to be correlated to some extent with height. Fair positive partial correlations were obtained for number of fruiting branches and height. The partial correlation coefficients showed that the other characters studied were not correlated uniformly with each other.

Studies in crop variation.—VI, Experiments on the response of the potato to potash and nitrogen, T. Eden and R. A. Fisher (*Jour. Agr. Sci. [England], 19 (1929), No. 2, pp. 201–213*).—This paper places on record further examples of experiments, e. g., comparisons of potassium carriers for potatoes and response of potatoes to varying quantities of nitrogen and potassium, involving the technic described earlier (E. S. R., 58, p. 632).

The sampling of cane in the field, J. G. Davies (*Mem. Imp. Col. Trop. Agr., Trinidad, Sugar Technol. Ser. No. 3 (1930), pp. 8, figs. 2*).—Cutting each stalk of sugarcane longitudinally into four and using one of the quadrants so obtained was not found significantly more accurate than cutting each cane longitudinally into two, whereas both of these methods were in turn significantly more accurate than cutting each cane transversely into three. The size of the laboratory mill in which the subsample is ground did not seem to affect the standard error to any large extent. The first method is suggested as suitable for use in subsampling the sample from an experimental plat, the second method for use in ordinary routine work, e. g., in determining degree of ripeness of a field, and the third method, while the most rapid, only for very rough estimations.

Ninety-six stools collected at random from a field of sugarcane and weighed, ground, and analyzed separately showed considerable variation both in weight and sucrose percentage. The small standard error of the mean of the 96 stools showed that a sample of this magnitude gives a very fair basis for work. Stools collected from drain rows were lower in sucrose than those collected from rows between drain rows and middle rows, and stools from such intermediate rows were lower in sucrose than those from the middle rows.

Methods of spring wheat tillage, A. L. Nelson (*Wyoming Sta. Bul. 173 (1930), pp. 14, figs. 3*).—The effects of the preceding crop and tillage on the yields of spring wheat grown under dry land conditions were studied in cooperation with the U. S. Department of Agriculture at the Archer Field Station near Cheyenne from 1914 to 1929.

Spring wheat cropped continuously averaged about 10 bu. per acre regardless of the method of tillage employed, although the yield was decreased with fall plowing. Corn land or potato land prepared with the duckfoot cultivator and fallow were about equal in production of spring wheat, and all resulted in higher acre yields than made by continuous cropping. Seeding the wheat on duckfooted bean land resulted in the highest yields, and the practice appeared to be adapted to extensive production. Barnyard manure increased wheat yields considerably, while green manure proved to be of no practical value. Rotation, conservation of moisture, and fertility appeared to be of outstanding importance in determining possible increases in the acre yield of spring wheat, and plowing seemed to be a relatively minor factor.

Report of seed analyses, 1929, E. M. Gress and M. C. Mowry (*Penn. Dept. Agr. Bul. 486 (1930), pp. 92*).—The purity, germination, and weed seed content are tabulated for 1,253 samples of agricultural seed collected in Pennsylvania during 1929.

Official Seed Testing Station for England and Wales: Eleventh annual report, A. Eastham (*Jour. Natl. Inst. Agr. Bot., 2 (1930), No. 3, pp. 286–303, figs. 2*).—The average purity and germination of 26,583 samples of agricultural seed received from different sources in these countries during the year ended July, 1928, are tabulated and discussed, and examination questions on the principles and practice of seed testing are appended.

Weed problems in relation to the production and marketing of farm seeds, H. C. Rather (*Jour. Amer. Soc. Agron., 22 (1930), No. 5, pp. 409–416*).—Cleaning costs and shrinkage in the removal of weed seeds are discussed in this contribution from the Michigan State College as important items in producing clean seed. Good seed bed preparation and avoidance of contamination of clean fields by distributing and planting only clean seed are also valuable control measures.

The eradication of the weed Antidesma ghesaembilla, E. B. Martyn (*Agr. Jour. Brit. Guiana, 3 (1930), No 2, pp. 84–87*).—Further experiments on the control of *A. ghesaembilla* (E. S. R., 61, p. 227) indicated that a 5 per cent solution of sodium arsenite is adequate to kill the stumps.

The use of sodium chlorate in the control of Johnson grass, H. J. Harper (*Jour. Amer. Soc. Agron., 22 (1930), No. 5, pp. 417–422, figs. 2*).—The effects of the time, rate, and method of application of sodium chlorate and certain other chemicals for the control of Johnson grass were studied at the Oklahoma Experiment Station in 1928 and 1929.

Two or three sprays were enough to eradicate the grass, although if viable seed were in the soil a new crop of plants would appear the next season, and unless the area was under cultivation another spray would be required to kill the young plants. Where the Johnson grass can be cut with a mower the first crop evidently should be cut just as the heads begin to appear, and the spray should be applied to the second growth when about 12 to 18 in. high at the acre rate of at least 100 gal. of solution of 1 lb. of sodium chlorate per gallon. Sulfuric acid did not equal sodium chlorate in the control of the grass, nor was sodium chlorate effective when sprayed on the plants in the fall or scattered on the soil in the winter.

A marked toxic effect was produced in 1929 on a crop of oats grown on land where 200 lbs. of sodium chlorate was applied in two separate sprays in the summer and fall of 1928, and evidently was not wholly explainable by the fact that soils treated with sodium chlorate have a lower nitrifying power than untreated soils. It was found that the chlorate was decomposed in a moist soil at a summer temperature in less than 7 days, but that the nitrifying power of the soil was depressed considerably for several weeks following the treatment.

Controlling perennial weeds with chlorates, H. W. Hulbert, J. D. Remsberg, and H. L. Spence (*Jour. Amer. Soc. Agron., 22 (1930), No. 5, pp. 425–433*).—The results are reviewed of experiments by the Idaho Experiment Station wherein 13 species of perennial weeds were treated with sodium chlorate under irrigated, nonirrigated, and dry land conditions. The weeds included morning-glory (*Convolvulus arvensis* and *C. sepium*), Canada thistle, Russian knapweed, whitetop, perennial sow thistle, quack grass, blue-flowering lettuce, poverty weed, yellow toadflax, willows, and wild rose. The chlorates of calcium and magnesium also received attention. While the commercial use of chlorates for weed control purposes in Idaho has met with gratifying success, certain features which limit the effectiveness of the treatments may be summarized from extensive observations during the entire growing season.

The full effectiveness of the treatments is not evident until the following season. For best results the areas should not be cultivated just before the application of chlorates, and the underground root system should be represented by an appropriate amount of top growth. The effectiveness of the treatments was found to increase as the plant approached maturity. The borders of the treated areas should be watched closely the following season, since it is apparent that the underground root system extends beyond the outer limit of the top growth. Areas should not be irrigated following treatment. Where the water table approaches the surface of the ground at certain seasons of the year it was observed that treatments are more effective if the water table remains stationary at the time of application or is slowly lowering. If the water table continually approaches the surface there is a zone of roots near that water table which will not be effectively killed. The temperature of the air and the time of the day of the application appear to have very little influence upon the effectiveness. Complete eradication does not seem to follow often enough to warrant the statement that one application is plenty.

Under irrigation it is recommended that the chemical be dissolved in water at the rate of 1 lb. per gallon and applied to plants in undisturbed areas after full bloom stage and in quantity enough to moisten all vegetation. The area should not be disturbed during the remainder of the season, except with whitetop, where a second application may be required to prevent seeding. The application should be repeated the next season if necessary. In nonirrigated areas the general recommendation for all perennial weeds is to apply enough of a 10 per cent solution to wet the weeds thoroughly.

HORTICULTURE

[Horticulture at the Missouri Station] (*Missouri Sta. Bul. 285 (1930), pp. 84, 85–93, figs. 2*).—Hardiness studies continued (E. S. R., 62, p. 39) by H. D. Hooker showed that the amount of ice formed in apple tissues killed by rapid freezing was no greater than that formed at the same temperature in tissues that survived slow freezing, indicating that death from low temperature is not caused by the amount of ice removed from the cells but more likely is determined by the rate of water loss.

As reported by J. T. Quinn, southern-grown plants of the Bermuda onion were superior to plants produced in the greenhouse at Columbia. Yellow Bermuda onions yielded more and produced less culls than did the Crystal White Wax or Red Bermuda varieties. The Yellow Bermuda responded better to a 4–12–4 fertilizer than did the other two.

Additional crosses were made by A. E. Murneek in the project on breeding apples for late blooming.

Studies upon the resistance of tomatoes to wilt (*Fusarium lycopersici*) were continued by Quinn. Strains of Norton showed the highest resistance but were surpassed in yield by the Missouri 1001 strain of Marglobe, which in field tests appeared best adapted to soils of moderate fertility. Under greenhouse conditions Marglobe matured a satisfactory crop but was late in ripening and was surpassed in yield by certain English varieties. Tests by Quinn of various Copenhagen Market cabbage strains for wilt resistance (*F. conglutinans*) showed from 8 to 76 per cent of infection, whereas commercial stocks proved a total failure. Selections of the Marion Market strain of Copenhagen showed the greatest resistance. Selections of Charleston and Jersey Wakefield cabbages were infected from 40 to 76 per cent, and strains of the late type Wisconsin Hollander were the most resistant varieties grown.

As recorded by Hooker and Swartwort, biennially bearing York Imperial trees were induced to bloom in the off year by nitrogen applications in the spring and fall of the off year and severe pruning in the winter following fruiting. Pruning following the off year was confined to thinning. Some evidence was secured on stored fruit that heavy applications of nitrogen in the fall increased scalding of apples.

Working with grapes, Hooker and Swartwout obtained no response to ammonium sulfate, except in the case of Concords on poor soil. Here the leaves were darker green and defoliation occurred later than on check vines. Analyses of the canes failed to show any constant or appreciable increase in nitrogen, either total or water soluble, in the fertilized vines. In the spring there was an accumulation of nitrogen at the nodes and a decrease of the nitrogen in the internodes down to a constant level. The amount of nitrogen at the nodes increased progressively from the base to the end of 12- and 16-node canes but was practically the same at all the internodes.

Studies by Murneek upon hardy varieties and seedlings of peach showed but little difference in the time of flower bud development and anthesis in spring, but there was considerable variation in the rate of growth and development.

That black walnuts may be propagated by cleft grafting and pecans and hickories by patch budding was shown by T. J. Talbert and Murneek.

Apple pollination studies by Murneek showed no perceptible difference in the germination of apple pollen in 10 per cent sugar whether the pollen had dried on the tree or in the laboratory. Jonathan. Ben Davis, Gano, Delicious, and Grimes pollen gave the highest germination. Four characteristic waves of abscission were noted in the apple, the severity of which was apparently subject to conditions of self- and cross-fertilization.

The results of a variety and fertilizer test of cantaloupes and watermelons are reported by Quinn.

Further evidence was obtained by Talbert, Hooker, and Swartwout that sprays are more effective than dusts in the control of severe outbreaks of insects and diseases. Peach leaf curl was effectively controlled by cold mix lubricating oil emulsion, 1.5 gal. to 50 gal. of 2-4-100 Bordeaux mixture. The oil emulsion and Bordeaux mixture or oil emulsion and lime-sulfur, summer strength, applied when the leaf buds were opening was found effective for aphids, apple scab, and black rot leaf spot. No accumulative injury to fruit trees was noted after five years of treatment. Oils at summer strength were used without material injury to fruit and foliage throughout the spring and summer, except at the calyx period in the apple. Oil emulsions were used with standard insecticides and fungicides when the leaves appeared in the spring for the control of scale and aphids. The delayed dormant spray of oil emulsion combined with the regular summer spray proved the most economical and effective spray application. Oil combined with standard summer insecticides and fungicides gave good control of scale, scab, black rot, curculio, and canker worms. Bordeaux mixture which had stood for from 24 to 48 hours caused no perceptible increase in fruit or foliage injury as compared with fresh material. Diluting Bordeaux mixture and lime-sulfur gave quite as good results as did standard concentrations. Serious injury did not follow the spraying of trees in full bloom with strong dormant sprays.

Murneek established a definite correlation between leaf area, growth, and the chemical composition of apples. With an increasing number of leaves up to a maximum there was a corresponding enlargement of the edible portion of the apple and a higher concentration of organic acids and sugar, and the older wood showed an increase in percentage of total and soluble nitrogen, while the new growth and leaves showed a conspicuous decrease. A study of the autumnal distribution of nitrogen and carbohydrates showed the following chemical changes at the time of leaf fall: The nitrogen content of leaves decreased during the latter part of autumn until the occurrence of defoliation. The least nitrogen was present in the yellowed and dropped leaves. The percentage of nitrogen increased during this period in the nonbearing spurs. Preparatory to exfoliation a considerable part of nitrogen migrated from the leaves into one-year-old twigs and thence to older wood. Soluble carbohydrates likewise migrated from leaves to permanent vegetative organs, and a large proportion was stored in the twigs in the form of hemicellulose. Growth of reproductive organs was controlled by inclosing them in pressure cups and thus holding them to definite dimensions of development. Preliminary tests on the presence of the ovarian hormone in plants during sexual reproduction gave negative results.

A study of the shipment of fresh fruits and vegetables to the Far East, E. L. Overholser (*California Sta. Bul. 497 (1930), pp. 77, figs. 20*).—General observations, supplemented by tabulated data on humidity and temperature changes in the fruit and in the air in the ship's hold and on the changes in the composition of the air in the hold, are presented on the methods of handling and disposing of California fruits transported by ship to oriental markets.

The subject matter is presented in three parts, (1) the conditions surrounding the cargo in the refrigerated hold, (2) the response of the experimental cargo, and (3) conditions under which fruit is handled in the various ports visited.

Summary of State and Territorial plant quarantines affecting interstate shipments, M. A. Thompson (*U. S. Dept. Agr., Misc. Pub. 80* (*1930*), *pp. 128*).—This loose leaf pamphlet contains brief summations of the regulations promulgated by the various States, the District of Columbia, and Hawaii and Porto Rico.

The "maturation period" of the tomato plant, W. F. Bewley and W. Corbett (*Ann. Appl. Biol., 17* (*1930*), *No. 2, pp. 267–279, figs. 4*).—Studies at the Experimental and Research Station, Cheshunt, England, showed that tomato blooms approaching expansion on one day are fully open the next morning. Every fruit on a plant did not develop in the same number of days, but, in general, the maturation period lengthened as the plant aged and the truss lengthened. There were varietal differences, the Ailsa Craig being the most uniform in maturation of the five varieties observed. Heading the main stalk at different cluster heights had some influence upon the uniformity of the maturation period.

Studies on tree root activities.—Part II, Some factors which influence tree root respiration, G. H. Harris (*Sci. Agr., 10* (*1930*), *No. 9, pp. 564–585, figs. 7*).—Following an earlier article (E. S. R., 61, p. 524) describing the apparatus used for studying respiration of fruit tree roots, the author here discusses certain of the factors which influenced root respiration in the same studies. There appeared to be an inherent difference in metabolism of distinct species, as measured by the carbon dioxide output. Differences within a single species are explained in the light of the following factors: (1) Root injury, which resulted in a temporary increase in respiratory activity. (2) The bursting of the buds, which was followed by a depression in root respiration, the vegetative buds showing this more conspicuously than did blossom buds. (3) Root respiration increased rapidly with shoot elongation until about the time elongation ceased. With a cessation of root elongation and the consequent availability of reserves for other growth processes stem diameter increased rapidly, at the same time cutting down root respiration. When diameter increase in the top ceased root respiration again increased; thus diameter growth of the top depressed root respiration, while diameter growth of the root increased the same. (4) New root growth in length continued after all other activities had apparently ceased but usually was accompanied by relatively low respiratory activity.

A study of the effect of certain fertilizer and cultural treatments upon the vigor of young Stayman apple trees, C. B. Wiggans (*Arkansas Sta. Bul. 254* (*1930*), *pp. 17, figs. 9*).—Using as plant material 1-year Stayman Winesap trees set out in the spring of 1926, with differential cultural treatments begun in the spring of 1927, no evidence was obtained from measurements of the growth that trees in fertile soil under good cultural conditions responded significantly to fertilizer treatments. Decided gains over control treatments were secured with trees under poor culture, representative of the average commercial treatment. In the absence of fertilizers good culture was consistently better than poor culture, but the differences were not as great as when fertilizer was used. The most vigorous trees in the experiment were produced on areas covered with a nonleguminous straw mulch. Gains from clean culture without fertilizer over poor culture with fertilizer were small but statistically significant. There was a decided tendency for the effects of the various treatments to be cumulative.

Influence of environment on the callusing of apple cuttings and grafts, W. B. Shippy (*Amer. Jour. Bot., 17 (1930), No. 4, pp. 290–327, pls. 2, figs. 7*).—Working at the Boyce Thompson Institute for Plant Research under conditions of systematically controlled temperatures and moisture environments, the author found that temperature may be successfully employed in controlling the development of callus on apple cuttings and grafts. Between 0 and 5° C. only slight callus was formed after several months; at 10° callusing proceeded very slowly; at 15° callusing began slowly but was accelerated later; at 20, 25, and 32° callusing was increasingly rapid, with some suggestion that the greatest final volume of callus was attained at about 20°; at 35° callusing was not satisfactory; and at 40° death of the tissues occurred. Air moistures below the saturation point were generally inhibiting to callus formation, producing desiccation. Moisture conditions provided by moderately moist peat, sphagnum, or sand were favorable, and peat moss containing 100 per cent by weight of water was satisfactory, with no perceptible benefit or injury with the proportion of water to peat moss increased from three to four times. Beyond this point aeration apparently was a limiting factor. Concerning the composition of the air, callusing occurred in high concentrations of oxygen but was inhibited in 100 per cent oxygen. High concentrations of carbon dioxide, especially in the presence of limited oxygen, prevented callusing.

A distinct polarity was manifested by both scion and root cuttings, irrespective of their position. Varietal differences in callusing were noted, and, together with polarity, were factors in the occurrence of overgrowths at the point of union of root-grafted trees.

The relation of maturity in the apple to relative winter injury, B. H. Wilson (*Sci. Agr., 10 (1930), No. 9, pp. 598–606, figs. 3*).—In studies at the University of Minnesota Fruit Breeding Farm with trees seven and eight years of age there was noted a significant relationship between the time of leaf fall and winter injury, as determined by the Beaumont-Hildreth method. No correlation was observed, however, unless some of the leaves persisted through the winter. There was no correlation between twig elongation during different periods of the summer and the amount of winter injury. Under the conditions of the experiment those varieties in which twig growth ceased early were no hardier than those in which growth continued late.

Physiological investigations on the resistance of peach buds to freezing temperatures, H. L. Crane (*West Virginia Sta. Bul. 236 (1930), pp. 80*).—Observations extending over a 3-year period on the influence of cultural and other treatments upon the hardiness of Salwey and Greensboro peach buds indicated that within any given variety treatments which tend to increase the stored food in the bud also tend to increase hardiness. On the other hand, a high degree of negative correlation was found between the total moisture and total nitrogen contents of buds and their resistance to freezing injury, being in one year —0.864±0.032 and —0.679±0.068, respectively. Wide differences were found in the carbohydrate composition of the buds of the two varieties, Greensboro (the hardy variety) buds being low in reducing, nonreducing, and total sugars and starch but high in alcohol-soluble nonsugars and hemicellulose.

Among practices reducing hardiness of fruit buds were pruning, either dormant or summer, nitrate fertilization, and partial defoliation. These three treatments increased the percentage of total nitrogen in the buds. On the other hand, ringing about the middle of June increased hardiness and incidentally reduced the percentage of total nitrogen. Some evidence was secured that the pistils of buds of ringed limbs were more resistant to cold than were normal buds.

Cytological investigations of buds collected during the winter showed development during this season, Salwey buds making the more rapid progress. Buds, as judged by pollen formation, were generally further developed on the terminal than on the basal portions of the shoots. Cropping apparently reduced bud hardiness, possibly by causing the depletion in food reserves.

The effects of fertilizers on the keeping qualities of Bon Chretien pears (*So African Fruit Grower and Smallhold., 17 (1930), No. 6, p. 144, fig. 1*).—Bon Chretien (Bartlett) pears grown in South Africa on trees receiving nitrogen, phosphoric acid, and potash are said to have kept significantly better than fruit grown on plats receiving only nitrogen and phosphoric acid. The pears were gathered from comparable sides of the trees at approximately the same height and stored at low temperatures. The flesh of the potash-fertilized pears was apparently firmer and less juicy, with less tendency for shriveling than in the nitrogen-phosphoric acid fruits.

Some cold-storage and freezing studies on the fruit of the vinifera grape, D. B. Carrick (*New York Cornell Sta. Mem. 131 (1930), pp. 37, pl. 1, figs. 9*).—Continuing the series of studies relating to the handling and storage of deciduous fruits (E. S. R., 61, p. 426), data are presented on studies with the vinifera grape. As with other fruits, supercooling was possible, ranging in the Emperor variety from 0.4 to 11.55° F. The average freezing point of Emperor grapes based on 242 readings was 25.6°, for Flame Tokay on 135 readings 25.88, and for Malaga on 61 readings 27.45°. The osmotic pressure of the cell sap of unfrozen grape pulp was 10.74 atmospheres greater than that of the same tissue after exposure to freezing temperatures. Little difference was found in the depression of cell sap expressed from frozen and unfrozen grapes. Low temperature (1 to 2 hours at —7.5° C.) significantly increased the respiration of Emperor grapes, while freezing for 4 hours had little effect on the normal carbon dioxide output. Catalase activity in Emperor grapes was not easily influenced by freezing but with extreme treatments became almost extinct.

In general, grapes kept best at the lowest temperature at which they could be held without actually freezing. For Emperor 28.4° F. gave the best results. A relative humidity of from 85 to 90 per cent at from 28 to 30° is deemed satisfactory. Five other varieties kept better at 28.4 than at 32°. Measuring the respiratory rate of Emperor grapes at different temperatures near 0° C., the author concludes that between —3° and +1.75° the increase in speed of carbon dioxide evolution lies within the limits of the Van't Hoff-Arrhenius law.

The California avocado industry, R. W. Hodgson (*Calif. Agr. Col. Ext. Circ. 43 (1930), pp. 86, figs. 26*).—This publication is a complete revision of California Experiment Station Bulletin 365 (E. S. R., 50, p. 342).

Boron as an essential element for healthy growth of citrus, A. R. C. Haas (*Bot. Gaz., 89 (1930), No. 4, pp. 410–413*).—A further contribution (E. S. R., 62, p. 142) from the California Citrus Experiment Station dealing with the boron requirements of citrus trees.

When grown in galvanized iron containers a lack of supplied boron resulted in poor growth, whereas in earthenware containers apparently sufficient boron was obtained by the plant from the container itself. Observing symptoms in citrus orchards similar to those obtained in boron-deficient cultures, the author concedes the possibility that boron may be a limiting factor in certan orchards.

The production of oranges in Spain, W. R. Brown (*Imp. Inst. Agr. Research, Pusa, Bul. 198 (1929), pp. [3]+19*).—A general account of methods of culture, harvesting, and marketing.

Multiplication of selected coffee trees in the College of Agriculture by grafting, T. Romero (*Philippine Agr., 19 (1930), No. 1, pp. 53–67, figs. 6*).—Of a total of 2,297 grafts made with coffee plants 1,792 were successful, the percentage of success varying significantly with the species and varieties used. For protecting grafts, sphagnum moss and banana leaf petioles proved valuable during the dry season, and glass tubes were effective in the rainy period. The best scions were obtained from the main stems or upright suckers.

The Australian bush nut (Macadamia ternifolia spp.), H. W. EASTWOOD (*Agr. Gaz. N. S. Wales, 41 (1930), No. 6, pp. 429, 430*).—Brief comments are presented on propagation, selection of improved types, etc.

The chrysanthemum and its culture, E. A. WHITE (*New York: Orange Judd Pub. Co., 1930, pp. XIV+15-192, pls. 25*).—A general discussion upon the history and development of the modern chrysanthemum and upon culture in the open and under glass.

Roadside development, J. M. BENNETT (*New York: Macmillan Co., 1929, pp. XVI+265, figs. 101*).—A general discussion of plans, planting materials, methods of planting, maintenance, etc.

FORESTRY

How the national forests of California benefit the State, S. B. SHOW (*U. S. Dept. Agr., Misc. Pub. 82 (1930), pp. 8, figs. 4*).—A brief statement is made of the major benefits of national forests in California in the way of actual financial returns to the State, development of good roads, recreational features, and in the conservation of water power, timber, and grazing resources.

The shade, windbreak, and timber trees of South Dakota, N. E. HANSEN (*South Dakota Sta. Bul. 246 (1930), pp. 48, figs. 5*).—Following general notes on the desirability of various species for special uses, descriptive information is presented upon a large number of tree species which occur or have been introduced into South Dakota.

Seed flight in the Douglas fir region, L. A. ISAAC (*Jour. Forestry, 28 (1930), No. 4, pp. 492-499, figs. 2*).—Employing two methods, (1) the placing of seed traps and (2) the releasing of winged seeds in the air with results recorded on the snow, evidence was obtained by the Pacific Northwest Forest Experiment Station that the abundance of the crop, the height of the release, the wind velocity, and the species all bear on the distance and the density of forest seed distribution. Under natural conditions, with a heavy crop of seed, fair numbers (8,000 per acre) were found 900 ft. from the edge of the timber. With light crops the effective distance was cut in half. Comparing 150- and 210-ft. trees, the seed of the latter was carried twice as far. As shown in the balloon and kite tests, the increase in distance of dissemination is more than directly proportional to the increase in height of release. A lesser distribution from trees than from the apparatus is ascribed to the air obstruction by the timber itself and to the fact that high winds usually occur in moist weather, with minimum seed release.

Influence of forest litter on run-off, percolation, and erosion, W. C. LOWDERMILK (*Jour. Forestry, 28 (1930), No. 4, pp. 474-491, figs. 7*).—Experiments conducted by the California Forest Experiment Station showed that burned surfaces had a greater run-off in every instance than did litter-covered areas. The litter was most effective when overlying fine-textured soil. After a year's service litter apparently gained in effectiveness in aiding rain penetration, a fact associated with the activity of soil fauna. Forest litter continued to function in approximately the same degree irrespective of the length of the rain. Fine-textured soils yielded the greatest amount of sediment.

Comparing the percolation of clear and muddy water, the author found that muddy water percolates through a sandy loam at only a fraction of the rate of clear water. In the case of bare soil the accumulation of a layer of suspended particles at the soil surface greatly reduced the rate of percolation, and to a degree sufficient to account for the large differences in absorption recorded. The author believes that the most important function of litter may be in the maintenance of the natural characteristics of the soil by keeping the rain water clear. The capacity of forest litter to absorb rainfall is deemed an insignificant factor as compared with its function in maintaining the maximum percolating capacity of the underlying soil.

Factors influencing decay of hardwood slash in northern New England and their relation to lopping, P. SPAULDING (*Jour. Forestry, 28 (1930), No. 4, p. 567*).—The species, the rate of growth, the direction of the slope upon which the slash lies, and the moisture content of the soil were found by the Northeastern Forest Experiment Station to be important factors in the decay of hardwood slash in northern New England. Ranging from most rapid to least rapid in decay are listed aspen, poplar, paper birch, basswood, beech, maple, yellow birch, ash, oak, and chestnut. Sapwood usually decayed more rapidly than heartwood, but in some species there was little difference. On warm slopes slash may season and then resist decay, while on cold slopes slash may become water-logged and also resist decomposition. Soil suitable for corn or potatoes had about the optimum moisture for hastening slash decay. Lopping is deemed desirable in the case of ash, oak, and chestnut, but of little value with aspen, poplar, or paper birch, and of doubtful value with beech, maple, and basswood because of their water-logging tendencies.

How long does hardwood slash remain a fire menace? H. F. SCHOLTZ (*Jour. Forestry, 28 (1930), No. 4, p. 568*).—Observations by the Lake States Forest Experiment Station in Wisconsin and Michigan showed that most hardwood slash up to 2 in. in diameter generally decomposes within 4 to 7 years, whereas white pine and hemlock may endure for from 12 to 15 years. Basswood logs and stumps remained a fire hazard for from 10 to 12 years. Sugar maple and yellow birch decayed beyond the danger point in from 15 to 17 years. Elm was highly resistant, fairly solid logs and stumps being found from 25 to 30 years after cutting, though their fire hazard had ceased somewhat earlier. White pine, hemlock, and white cedar were more resistant to rot than hardwoods, excepting elm. Stumps and logs of white pine were found in good condition 35 to 40 years after logging, and white cedar and hemlock slashes are deemed hazardous for from 20 to 30 years.

Effect of fire on Douglas fir slash, R. E. MCARDLE (*Jour. Forestry, 28 (1930), No. 4, pp. 568, 569*).—Data gathered by the Pacific Northwest Forest Experiment Station showed an average of 155 cords per acre of wood débris left after logging Douglas fir. Fires in fresh slashings are said to consume not more than 30 per cent of the volume of the larger pieces, while in 10-year slash about 50 per cent of the larger material was burned. Small slash was more readily consumed, about 50 per cent being burned in light fires in fresh-cut slash. Cedar slash appeared to burn more readily than other species. In a mixed cedar, Douglas fir, and hemlock slash about 40, 30, and 10 per cent, respectively, could be consumed by fire.

Turpentining experiments with western yellow pine in northern California, T. N. MIROV (*Jour. Forestry, 28 (1930), No. 4, pp. 521–532, figs. 2*).—Yields of oleoresin and turpentine are presented by the California Forest Experiment Station for several locations and show much larger yields in central than in northeastern California. Where trees were exposed to direct insolation the southwest quadrant yielded more oleoresin than did the southeast, but not necessarily so with trees partly shaded. Comparisons between split and regular faces did not give consistent results. Mature trees were more productive of oleoresin than were overmature trees. Considerable variation in the composition of the resulting turpentine suggested the existence of different types of *Pinus ponderosa* in this region.

Wood fibers, G. J. Ritter (*Jour. Forestry, 28 (1930), No. 4, pp. 533–541, figs. 12*).—The results are presented of a study at the Forest Products Laboratory, Madison, Wis., upon the microstructure of the fibers of some 16 species of wood. The middle lamella of mature woods did not have the solution or chemical properties of pectin but was a form of lignin. Two types of lignin, middle lamella and cell wall, are distinguished. The cell wall of a fiber was found composed of several separable layers, and the layers in turn were made up of fibrils. The fibrils of the outer layer were oriented at approximately right angles to the fiber's axis, while those of the remaining layers ranged from 0 to 30°. Fibrils may be separated into symmetrical fusiform bodies. Cellulose and lignin prepared from wood were distinguished by their respective optical properties.

Suitability of the Liljenstrom dendrometer for reading diameters of trees in black walnut plantations, R. K. Winters (*Jour. Forestry, 28 (1930), No. 4, pp. 511–514*).—The use of the Liljenstrom dendrometer, a telescopic instrument for measuring the height and diameter at various elevations, is discussed. In height, the error of the instrument, as shown by comparison with actual measurements, varied from —5.7 to +5.1, with 88 per cent of the total number of measurements showing errors less than ±3 per cent and with no significant relation between the amount of error and height of measurement. Errors in diameter were greater, due to the fact that trees were not uniformly circular. On one tree errors of 18.4, 19.8, and 12.7 per cent were recorded at 1, 2, and 3 ft. from the ground, due to natural swellings. The use of this dendrometer was abandoned because of these errors, notwithstanding that it greatly hastened record taking.

DISEASES OF PLANTS

Principles of plant pathology, C. E. Owens (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. XII+629, figs. 222*).—The material in this book, planned as the basis for a general undergraduate one-term or one-semester course in plant pathology in schools of agriculture, is believed to be suitable also for use in a course in applied botany in nontechnical colleges and universities.

The first part of the book consists of a discussion of topics of general interest concerning the nature, causation, and control of plant diseases. The particular diseases selected for study in the second part have been chosen from a wide field as to types of causal agents, as to symptoms, and as to range of host plants, the diseases being classified on the basis of causation.

Brief directions for laboratory work are included, but are not regarded as in the nature of an essential part of the book.

Physiologic specialization in plant pathogenic fungi, E. C. Stakman (*Leopoldina, 4 (1929), pp. 263–289, pls. 5, fig. 1*).—This paper is said to be based on a lecture given in the spring of 1927 under the auspices of the Mayo Foundation of the University of Minnesota and the Graduate Schools of the Universities of Wisconsin and Iowa. A bibliography of 146 titles is appended.

Bridging hosts, H. M. Quanjer (*Rec. Trav. Bot. Néerland., 25A (1928), pp. 250–259*).—"Some examples, gathered from experience and from the literature on plant-parasitic nematodes, seem to prove that adaptation to new hosts, as well as weaning nematodes away from hosts to which they are accustomed, are very common phenomena."

Botany (*Missouri Sta. Bul. 285 (1930), pp. 55–57*).—As determined by I. T. Scott in studies of numerous isolations of the wheat scab organism (*Gibberella saubinetii*) strains producing only the conidial stage in culture agreed morphologically in spore shape, size, septation, and method of production with those strains producing perithecia in culture. There were differences in certain physiological characters, such as color produced in media and in H-ion equilibrium point, produced by washed mats in single salt solutions with different initial pH values. Physiological differences were noted between corn and wheat strains, one corn strain showing saltation in culture.

Studies with the tomato wilt organism (*Fusarium lycopersici*) showed that when washed mats were placed in single nontoxic salt solutions having different initial pH values the final equilibrium was reached at pH 5.4 to 5.5. Growth was greatly inhibited in solutions initially acid to pH 5.5 when the toxic salts KCN and KI were present at concentrations near their toxic limits for the organism. The addition of the toxic salts $HgCl_2$ or $CuSO_4$ to the nutrient solutions showed the greatest inhibition on the alkaline side of pH 5.5. H-ion equilibrium studies were also carried on with various other pathogenic fusaria. Evidence was secured in the greenhouse that fusarial pathogenes of alfalfa gain entrance largely through wounds in the root or crown.

Studies by Scott, E. T. Gomez, H. W. Rickett, F. E. Drouet, and R. E. Zirkle upon Pythium seedling disease of dent corn showed the causal organism to be identical with *P. arrhenomanes*. The organism confined its attack to the germinating embryo, primary root, and sometimes the secondary rootlets, invading only the cortical tissues.

As reported by W. J. Robbins and J. R. Jackson, killed fern male gametes (antherozoids) were found to react to stains differently according to the pH concentration. The isoelectric point, as measured by this method, was more acid than that of cells of other plants studied, that of the nucleus being more acid than that of the cytoplasm, contrary to conditions in other cells.

List of [plant] diseases in Devon and Cornwall [including the Scilly Islands] (*Seale-Hayne Agr. Col. Pamphlet 30 (1929), pp. 24–32, 41*).—A list is given which is said to be as complete as is possible to date of diseases of plants usually with the addition of the genus and species of the disease organism), so far as yet recorded, as in both counties or as in either county exclusively.

Notes on diseases during the year [1928, Devon and Cornwall] (*Seale-Hayne Agr. Col. Pamphlet 30 (1929), pp. 33–36*).—The principal diseases of agricultural plants (cereals, potatoes, root crops, vegetables, fruit trees, and flowers) were slight on account of low rainfall as tabulated for March to August.

Corticium vagum B. and C., the cause of a disease of Vigna oligosperma and other plants in Ceylon, C. H. Gadd and L. S. Bertus (*Ann. Roy. Bot. Gard. Peradeniya [Ceylon Jour. Sci., Sect. A], 11 (1928), No. 1, pp. 27–49, pls. 4*).—The occurrence in Ceylon is recorded of *C. vagum* and its vegetative mycelium (*Rhizoctonia solani*) on *V. oligosperma, Arachis hypogaea, Oryza sativa, Musa paradisiaca,* and *Acacia decurrens*. This fungus is said to be parasitic on seedlings, though not usually on the adults, of many plants suitable for use as cover crops. Minor differences are said to occur between the various strains. Control methods are discussed.

A study of meadow-crop diseases in New York, J. G. Horsfall (*New York Cornell Sta. Mem. 130 (1930), pp. 139, figs. 28*).—In the absence of concrete information concerning various important diseases affecting grasses and legume plants used for hay, a study was made of the losses resulting from foliage troubles, of the typical symptoms of these diseases, of their life history, and of the value of sulfur and copper dusts as controls. A method of technic for estimating the losses from the various diseases is described, and a careful study was made of the more important pathogenes in an attempt to clarify the nomenclature and to determine the environments most favorable to their development. The results are summarized in tabular form to facilitate reference.

Concerning the use of fungicides, dusts alone were tried because of the greater speed at which the work could be done and better coverage due to the sifting of the dust through the dense mass of leaves. In laboratory tests it was ascertained that sulfur dust was no more effective at high than at low temperature; that hydrated lime apparently had no fungicidal effect on any of the fungi tested except *Puccinia phleipratensis;* that talc had no visible effect upon spores of *Helminthosporium vagans*, *H. triseptatum*, and *Macrosporium sarcinaeforme;* and that staling products accumulate in the moist germination chambers, necessitating the careful washing of equipment after each test.

Breeding disease resistant varieties of small grains in Minnesota, H. K. Hayes (*Leopoldina, 4 (1929), pp. 250–262*).—In studies carried on during some years in Minnesota in cooperation between plant geneticists and plant pathologists several new varieties of small grains having desirable agronomic characters and disease resistance have been obtained. These varieties include, among the most important, Anthony oats, resistant to stem rust; Marquillo spring wheat (*Triticum durum* × *T. vulgare*), resistant under field conditions to many physiologic forms of stem rust; and Velvet, Glabron, and Comfort, smooth-awned barleys resistant to the spot blotch disease (*Helminthosporium sativum*).

Heterodera punctata n. sp.—A nematode parasitic on wheat roots from Saskatchewan, G. Thorne (*Sci. Agr., 8 (1928), No. 11, pp. 707–711, pl. 1*).—The author notes examinations of nematode material received from R. C. Russell in 1926 and of more abundant material in 1927, Russell's published account of this nematode (E. S. R., 59, p. 640), and reports alleging that the form of *H. schachtii* found to attack wheat in Europe is apparently identical with that found on sugar beet. It is stated by the present author that when the specimens found in Canada are compared with specimens of *H. schachtii* from sugar beets grown in Europe and America, certain morphological characters differentiate the former sufficiently to justify the establishment of a new species. This is done, and the form on wheat roots in Saskatchewan is technically described as the new species *H. punctata*.

Control of bunt of wheat (*Seale-Hayne Agr. Col. Pamphlet 30 (1929), p. 36*).—It is concluded that copper carbonate powder is very efficient as a seed treatment for wheat bunt.

The reaction of wheat plants at two stages of growth to stem rust, J. B. Harrington and W. K. Smith (*Sci. Agr., 8 (1928), No. 11, pp. 712–725*).—A study was carried on in the greenhouse during two years of the relationship between the reaction of wheat plants in the varieties Marquis, Marquillo, Iumillo, and Vernal, all important in the rust resistance breeding work at Saskatoon, to stem rust in the seedling stage and the infection of these same plants after heading by these same rust forms, which are designated as forms 17, 21, and 36, and supposed to be the best known rust forms in western Canada.

The results showed a distinct positive correlation, which is particularized, with indication of resistant types according to numbers between seedling reaction and infection after heading in the material studied.

"It appears that seedling reactions may indicate different degrees of resistance or susceptibility in terms of after-heading reaction, depending upon the variety of wheat concerned. For the use of seedling reactions in practical breeding studies it would be advisable to obtain the reaction of each parent variety both in the seedling stage and after heading to each of the forms of rust used. . . .

"Comparison of results from two rust nurseries, in each of which only one form of rust appeared to be present, with after-heading results from the greenhouse, where the same forms of rust were used separately, indicated that after-heading reaction in the greenhouse closely resembled after-heading reaction in the nursery."

The wheat smut problem in high plains Oklahoma, H. H. Finnell (*[Oklahoma] Panhandle Sta., Panhandle Bul. 19 (1930), pp. 13, fig. 1*).—Discussing the general aspects of the problem, data are presented on the results of using smut-free seed in comparison with smut-infested seed of the same varieties. Whereas the smut-free seed produced no smutted heads, the controls ranged from 15.9 to 21.8 per cent infection. Complete control was obtained with both copper carbonate dust and formaldehyde, indicating that infection was altogether through the seed.

Relation between the vigor of the corn plant and its susceptibility to smut (Ustilago zeae), C. H. Kyle (*Jour. Agr. Research [U. S.], 41 (1930), No. 3, pp. 221–231*).—At Arlington Experiment Farm, Rosslyn, Va., selfed corn lines and F_1 crosses thereof were studied over a period of three years to determine the relation between smut reaction and plant vigor. In general, the more vigorous corn plants, whether growth was due to genetical or cultural causes, were more subject to smut. The percentage of water in immature plants was directly associated with growth rate and the relative number of smut galls. In general, crossing resulted in greater vigor and greater susceptibility. As a practical deduction, the author advises that smut resistance may be due to a lack of vigor and that the use of strains having such low vigor may result in lower yields.

Researches on potato-virus diseases in Montana, P. A. Young and H. E. Morris (*Montana Sta. Bul. 231 (1930), pp. 51, figs. 8*).—Studies of the symptoms of various diseases, mode of transmission, effect on yielding capacity, etc., were conducted. Willowy, spindling tops were found to be a late-season symptom of rugose and crinkle mosaics in the greenhouses. Rugose mosaic was transmitted quite readily from potato to potato by leaf-mutilation inoculations and tuber-core grafts, and also from potatoes to tobacco and tomatoes by leaf-mutilation inoculations. The incubation period for rugose mosaic was usually from 21 to 40 days. Since rugose mosaic was transmitted to potatoes separately containing mild mosaic, leaf rolling mosaic, and spindle tuber, it is concluded that the four diseases are specific. Necrotic leaf spots are important symptoms of rugose mosaic. The injuries caused by disease-free aphids are discussed.

Leaf rolling, supermild, and mild mosaics, spindle tuber, unmottled curly dwarf, witches'-broom, and leaf roll were transmitted from diseased to healthy tubers by core grafts. Curly flavescence and calico were not transmitted and are deemed to be possible genetic abnormalities. Globular, intracellular bodies in brittle, rolled leaves were typical symptoms of leaf roll, as was also an interveinal yellowing. Depressed, brown, cracked, corky lesions in tubers were symptoms of unmottled curly dwarf.

In regard to control, roguing was highly effective in eliminating crinkle mosaic, leaf roll, and spindle tuber from seed stocks. Yield reductions varying from 19 to 75 per cent were caused by some of the diseases.

Bacterial stripe diseases of sugarcane in Louisiana, W. N. CHRISTOPHER and C. W. EDGERTON (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 3*, *pp. 259–267*, *figs. 2*).—Of three leaf stripe diseases of sugarcane known to occur in Louisiana two are described and discussed in this paper from the Louisiana Experiment Station. One of these, known as red stripe and top rot (*Phytomonas rubrilineans*), is characterized by long, deep-red or maroon colored stripes on the leaves and by a rapid decay of the central portion of the stem, and the other, known as mottled stripe (*P. rubrisubalbicans* n. sp.), is characterized by the presence of long, predominantly red stripes on the leaf blades, with a mottled red and white condition frequently occurring. In both cases inoculations with pure cultures were invariably successful. The mottled stripe disease was transmitted to Johnson grass and sorghum, but not to corn. The susceptibility of various varieties and strains of sugarcane to the two diseases is cited.

Sugar cane mosaic [trans. title], F. A. LÓPEZ DOMÍNGUEZ (*Inform. y Mem. Soc. Ingen. Perú*, *30* (*1928*), *Nos. 10*, *pp. 466–478*, *pl. 1*, *figs. 3*; *11*, *pp. 445–455*).—A somewhat general account is given of sugarcane mosaic in Peru, its causation, relationships, consequences, and control, involving varietal susceptibility or resistance.

Experiments on the control of tomato yellows, M. SHAPOVALOV and F. S. BEECHER (*U. S. Dept. Agr., Tech. Bul. 189* (*1930*), *pp. 24*, *pls. 4*, *fig. 1*).—In studies conducted in California it was found that tomato yellows may be best controlled by covering the plants with temporary muslin tents which protect them from invasion by the beet leafhopper (*Eutettix tenellus*), found to be the exclusive carrier of this disease. The cost of covering is, however, so great as to prohibit its use except under conditions of high selling prices for the crops.

The existence of moderately resistant varieties is deemed indicative of the possibility of developing strongly resistant varieties by breeding. Resistance to date is, however, inadequate to enable plants to survive under conditions most favorable to the disease. No sprays or dusts were found of sufficient merit to justify their use. Good culture, which encourages deep rooting and provides for a considerable supply of organic matter in the soil, is considered important. Watering heavily during vegetative development was undesirable Controlling the time of planting so that plants may develop before or after the flight of the beet leafhopper is advised.

Factors affecting the control of vegetable diseases in storage, J. I. LAURITZEN (*Amer. Inst. Refrig. Proc.*, *17* (*1928*), *pp. 132–137*).—This account deals generally or specifically with such factors as weather, maturity, and other conditions and incidents before and during transportation as related to diseases and other deteriorations affecting values in vegetables.

Storage responses of some common fruits, E. L. OVERHOLSER (*Amer. Inst. Refrig. Proc.*, *17* (*1928*), *pp. 125–132*).—The average keeping periods of pears, plums, peaches, apricots, cherries, and avocados were greatly affected by the temperatures employed. The fruits kept best at 0° C., except avocados, most varieties of which kept best around 4.5°. Optimum periods and other data are detailed.

The diseases of apples which occur in storage, C. BROOKS (*Amer. Inst. Refrig. Proc.*, *17* (*1928*), *pp. 121–125*).—Soft-scald, a nonparasitic storage disease affecting mainly Jonathan and Rome Beauty apples and causing peculiar sunken blister-like areas often located at points of contact with containers or with other apples, is said to be favored by a decrease in oxygen supply and also by delays in storing. It occurs more commonly at temperatures near the freezing point.

Some observations on physiological diseases in apple in British Columbia, H. R. McLarty (*Sci. Agr., 8 (1928), No. 10, pp. 636–650, figs. 8*).—Apple tree physiological diseases of three types, called by their local names die-back, drought spot, and corky core, are defined and discussed, with an account of investigational work bearing upon the influence of cultural conditions and factors which are detailed as influencing growth in healthy or in diseased orchards. "The final mode of expression of this weakened condition, whether it takes the form of corky core, drought spot, or die-back, is, as we finally hope to prove, dependent upon either a variation in the severity of the unbalanced conditions or upon the time at which these occur, as well as the duration of that period."

Leaf scorch on fruit trees, I–V, T. Wallace (*Jour. Pomol. and Hort. Sci., 6 (1928), No. 4, pp. 243–281, pls. 3; 7 (1928), No. 1–2, pp. 1–31, pls. 2*).—An account is given of previous work and of studies on fruit tree leaf scorch as carried on by the author since 1921, including pot experiments with fruit trees in sand culture, soil investigations, and field experiments on control methods.

It is thought that leaf scorch results from defective nutrition. Unsatisfactory water supply conditions in the plant tissues are indicated as immediately causal, and evidences are detailed.

It is stated that apple trees, gooseberry and black currant bushes, and raspberry and strawberry plants all invariably exhibited leaf scorch symptoms when supplied with nutrient solutions deficient in potassium. Leaf scorch in apple trees was controlled by employing nitrogen : potassium ratios lying within a certain narrow range. The disease did not occur on gooseberry and black currant bushes or on raspberry and strawberry plants when supplied with a complete nutrient solution and periodically given "leaching" treatment.

Gooseberry bushes given a complete solution, but waterlogged, developed leaf scorch, the symptoms of which differed in certain ways from those due to potash deprivation. On gooseberry bushes given potassium-deficient supplies leaf scorch was controlled by spraying with a 1 per cent solution of potassium sulfate.

Experiments with apple varieties worked on to rootstocks differing as to leaf scorch resistance showed that a first-season detection could not be obtained by the method employed in the case of the rootstocks, although the varietal susceptibilities were to some extent indicated.

From data obtained at 46 centers it is reported that differences, usually in texture, could usually be detected between adjacent "scorch" and "nonscorch" areas, the former falling (with one exception) into three classes, namely, (1) light soils of poor water-holding capacities and low potash content; (2) close-textured silty soils with relatively unweathered impervious subsoils and occasionally subject to waterlogging; and (3) clay soils with defective drainage. In practically every case the "available" potash in the surface soil was found to be relatively small, while available phosphoric acid showed a wide range of values. The soils included some containing large supplies of carbonate of lime and others showing "lime requirements."

Attention is called to manurial experiments with dung and potash which are described as carried out at 13 centers. Considerable control was secured at several of these places. Cases occurred in which leaf scorch disappeared after the area was grassed down, the trees on such area exhibiting acute nitrogen starvation and often remaining stunted. The view is advanced that one of the chief ways in which "grassing down" reduces leaf scorch is by bringing about lowered nitrogen supplies within the tree. Grassing down alone will not usually provide a satisfactory remedy in leaf scorch plantations. Suitable manuring with nitrogenous and potassic manures will often be necessary in addition to this treatment. Such treatment is likely to be useful only where class 1 soil conditions occur.

The evidence obtained is regarded as supporting the view that leaf scorch results from unsatisfactory conditions of water supply within the plant.

Clasterosporium carpophilum parasitic on cherry [trans. title], H. Faes (*Pomol. Franç., No. 9 (1928), pp. 175–177*).—Cherry trees which had suffered severely from *C. carpophilum* in 1923 and 1924, and which had been treated with a 10 per cent copper spray May 20, 1925, showed little sign of the fungus on June 18 as compared with the controls. The same treatment, applied May 7, 1926, and followed later in May and early in June by abnormal humidity, showed violent development of the fungus. On June 17 but little advantage was shown by the treated trees, but on July 21 the trees that had been treated showed a decided advantage. The experience at the station favored the 1 per cent copper compound (considered as the limit if scorching is to be avoided) when neutralized with lime.

Four fungi on the endemic species of Rubus in New Zealand, B. J. Murray (*New Zeal. Inst. Trans. and Proc., 57 (1927), pp. 218–225, figs. 19*).—An account is given of *Erysiphe carpophila rubicola* on two types of *R. australis; Phyllosticta variabilis* causing leaf spots on *R. cissoides* and *R. australis*, and on *R. cissoides* infected with *Pestalozzia antennaeformis; P. antennaeformis* n. sp. on living stems of a bush of *R. cissoides*, also on *R. australis;* and *Coryneum ruborum* found with *P. antennaeformis* in cankers on living stems of *R. cissoides*, and more rarely in dead spots on leaves of *R. australis*.

A comparative study of the citrus blast bacterium and some other allied organisms, C. O. Smith and H. S. Fawcett (*Jour. Agr. Research* [*U. S.*], *41 (1930), No. 3, pp. 233–246, figs. 4*).—Studies at the California Experiment Station of three bacterial organisms (*Bacterium syringae, B. cerasi*, and *B. citriputeale*) grown in parallel cultures showed a close agreement in cultural and biochemical characters, so much so that it is thought that they might almost be classed as one species. The authors express doubt of this unity, although pathogenicity tests in many different hosts indicated a high degree of similarity. However, inoculations frequently suggested that the organisms were not entirely alike.

Temperature reactions when inoculated into lemon fruits caused lesions that agreed well in size and other characters at from 17 to 20° C., but at from 29 to 31° the citrus blast group was sharply differentiated by the larger lesions.

Some physiological studies of Phytomonas citri, K. W. Loucks (*Jour. Agr. Research* [*U. S.*], *41 (1930), No. 3, pp. 247–258, figs. 3*).—At the Florida Experiment Station it was observed that the rate of increase in population of *P. citri* grown in potato broth was greater at high than at low temperatures. For early growth the range between 29.5 and 34.5° C. was optimum. Cultures held at 28° were dead after 40 days, while those held at 11, 16, 20, and 24° lived for 57 days. The rate of starch transformation increased with the rise of temperatures up to 28° and thereafter declined.

No correlation was noted between change in pH values and temperatures at which the cultures were grown. At room temperature *P. citri* died after 13 days in unsterilized Florida muck, and after 6 days in unsterilized sandy soil, while in inoculated sterilized preparations of both muck and sandy soil viability continued for at least 150 days. No correlation was observed between longevity in sandy soil and its percentage content of moisture.

Bacterial leaf spot of betel, C. Ragunathan (*Ann. Roy. Bot. Gard. Peradeniya* [*Ceylon Jour. Sci., Sect. A*], *11 (1928), No. 1, pp. 51–61, pls. 2*).—

An account is given of a bacterial leaf disease of betel, with a technical description of the associated organism as the new species, *Bacterim betle,* the behavior of which on various media is also described. Inoculation of healthy leaves with this organism in pure culture gave typical disease symptoms and reisolation yielded the organism. Control suggestions are offered. The use of a poisonous spray is inadvisable, as the leaves are used for chewing. The most favored method is prompt hand picking of the leaves as soon as the presence of a water-soaked area on the under side of the leaf reveals the fact of infection.

Diseases and pests of Hevea brasiliensis in the Netherlands Indies, A. STEINMANN (*Buitenzorg: Proefsta. Rubber, 1927* [*Eng. ed.*], *pp. XII+42, pls. 57*).—This English edition of the book previously noted (E. S. R., 54, p. 454) presents an arrangement somewhat different from that of the original, some reductions, and, as an appendix, a review of commonly used fungicides and their preferable modes of application.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The book of bird life, A. A. ALLEN (*New York: D. Van Nostrand Co., 1930, pp.* [*XXI*]*+426, pl. 1, figs. 275*).—Following an introductory account of the study of birds, part 1 deals with the living bird (pp. 1–299) and part 2 with the methods of bird study (pp. 303–416).

A practical account of the morphology of insects, E. HANDSCHIN (*Praktische Einführung in die Morphologie der Insekten. Berlin: Borntraeger Bros., 1928, pp.* [*VIII*]*+112, pls. 23, fig. 1*).—The chapters of this account are devoted to the chitinous skeleton, head, appendages of the head, thorax, abdomen, endoskeleton, sound organs, spiracles, etc.

The water balance of plants as a factor in their resistance to insect pests, E. P. MUMFORD and D. H. HEY (*Nature* [*London*], *125* (*1930*), *No. 3150, pp. 411, 412*).—This is a review of the literature supporting the hypothesis put forward by one of the authors in 1925–26 that a disturbed water content, from whatever cause, renders certain plants more susceptible to the attack of sap-feeding insect pests, such as various species of thrips.

The plant as a factor in the action of Bordeaux mixture as an insecticide, D. M. DELONG, W. J. REID, JR., and M. M. DARLEY (*Jour. Econ. Ent., 23* (*1930*), *No. 2, pp. 383–390, figs. 2*).—The authors found from refractometer readings of sprayed and unsprayed plant juices that, as a rule, in vigorous growing plants the solid (sugar) content of the sprayed plants was lowered for about two days below that of the unsprayed plants, but soon became higher and with few exceptions usually remained higher than that of the unsprayed plants for about two weeks.

Effect on insects of treating seed corn with certain fungicides, W. P. FLINT (*Jour. Econ. Ent., 23* (*1930*), *No. 2, pp. 404–406*).—The author reports that the use of certain fungicidal treatments for seed corn does not give the insecticidal effect that has been claimed by some manufacturing companies.

Borax as an insecticide for protecting seed, H. H. SCHWARDT (*Jour. Econ. Ent., 23* (*1930*), *No. 2, pp. 401–404*).—Powdered borax applied to corn at the rate of 10 oz. in a bushel was found to control the rice weevil effectively. The four-spotted weevil (*Bruchus quadrimaculatus* (Fab.)) was controlled by the application of 20 oz. of borax in a bushel of cowpeas.

Relative insecticidal value of commercial grades of pyrethrum, C. C. MCDONNELL, W. S. ABBOTT, W. M. DAVIDSON, G. L. KEENAN, and O. A. NELSON (*U. S. Dept. Agr., Tech. Bul. 198* (*1930*), *pp. 10*).—"On the basis of the experiments and tests here reported, neither the commercial grade of pyrethrum flowers nor the locality in which the plants were grown can be accepted as giving an accurate criterion of the effectiveness of the product against insects. These experiments also show that there may be a greater difference in efficiency between two samples of the same commercial grade than between two samples of different commercial grades. This difference in effectiveness may be due to, or influenced by, one or more of the following factors: (1) Pyrethrums of different varieties, or grown under different climatic and soil conditions, may contain different amounts of the active constituents, and (2) conditions existing at the time of harvesting and the method of curing the flowers as well as the conditions encountered in shipping and storing them probably have an influence on their effectiveness. It is impossible under commercial conditions to harvest the product when all flowers are in exactly the same stage of growth. Furthermore, open (mature) flowers are likely to have lost a certain proportion of the achenes, which are the most effective portion of the flowers.

"Tests with the powdered achenes showed them to be significantly more effective than the disk florets and the disk florets more effective than the receptacles. In view of this, and the further fact that the greatest yield is secured when the achenes have reached maturity, it would appear that the most economical time to harvest the flowers would be when fully ripened, provided the crop can be handled so as to avoid loss of the achenes."

Pyrethrum and soap, a chemically incompatible mixture, R. C. ROARK (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 460–462*).—It is shown that pyrethrum is incompatible not only with soap but also with hydrated lime, lime-sulfur solution, sodium-sulfur and barium-sulfur combinations, dry lime sulfur, and other materials which dissolve in or are hydrolyzed by water to form alkaline solutions. Pyrethrum, or extracts thereof, should be sprayed in a solution, emulsion, or suspension as nearly neutral as possible and as soon as possible after being mixed with water. It is thought that the addition of saponin, of sulfonated oxidation products of petroleum so successfully used with nicotine, or other wetting or activating agents to pyrethrum or a pyrethrum extract (free from soap) will in most cases produce a mixture of at least as high toxicity as a mixture containing soap, and will have the advantage of being less readily decomposed.

Two arsenical substitutes, S. MARCOVITCH and W. W. STANLEY (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 370–376*).—In work at the Tennessee Experiment Station cryolite and barium fluosilicate, among the fluorine compounds, were found to offer the most promise of meeting the requirements of an arsenical substitute. They are highly toxic to insects and reasonably safe on foliage. Barium fluosilicate is somewhat more toxic to insects than cryolite, and both materials when used at the rate of 1 lb. to 50 gal. of water gave excellent control of the Mexican bean beetle. These materials may also be used as a dust on tobacco for the tobacco hornworm and the tobacco flea beetle and on beans for the Mexican bean beetle. Fish oil materially aids the sticking qualities of both cryolite and barium fluosilicate. See a previous note (E. S. R., 62, p. 543).

A comparison of four methods for estimating the relative toxicity of stomach poison insecticides, F. L. CAMPBELL (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 357–370, figs. 4*).—Three laboratory methods were employed in studying the relative effect of acid lead arsenate and sodium fluosilicate on the silkworm, namely, the sandwich method for the estimation of the median lethal dose, the sandwich method for the determination of the relation between dosage and speed of toxic action, and the simple cage test. The relative effect of the same compounds on mosquito larvæ, *Culex pipiens* L., was studied by the method of Marcovitch (E. S. R., 59, p. 456).

"It was concluded that only the first two of the foregoing methods measure the relative toxicity of stomach poison insecticides, and that the first of the two is the more practicable for the purpose. The last two methods may be suitable for measuring the relative effectiveness of stomach poisons. The cage test with appropriate insects should usually be the better of the two for this purpose. The toxicity of sodium fluosilicate to the fourth instar silkworm ranges from one to two times that of acid lead arsenate, depending on the method and criterion employed for its estimation. Any dose of the fluosilicate affected the silkworm more rapidly than the same dose of the arsenate."

A brief report on the tank-mixture method of using oil spray, R. H. SMITH (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 376–382*).—This is a report of work conducted at the California Citrus Experiment Station in continuation of that previously noted (E. S. R., 63, p. 154).

The tests conducted have shown "that it is entirely practicable, with modern orchard sprayers, to maintain a uniform mixture of water, emulsifier, and pure oil, added separately to the spray tank, by using large-sized blades on the agitators and increasing the speed of the agitator shaft to about 225 r. p. m. By dyeing the spray oil and placing a piece of heavy-walled glass tubing at each end of the spray hose, one between the spray tank and the hose and the other between the hose and the spray nozzle, the fact was determined that the oil globules do not coalesce or float out to any material extent in passing through the spray hose. Microscopic studies of samples taken from the spray tank and from the spray nozzle showed that even though globules of relatively large size might pass through the hose, these are broken into very small globules, quite comparable to those in proprietary emulsions, as a result of being forced through the nozzle under a pressure of 300 lbs.

"Studies on the quantity of oil deposited on glass and citrus leaves, 25 sq. in. being used as the unit of area, showed that certain proprietary emulsions deposited three times as much oil as others. The average amount deposited on the glass was 21 mg. Tests with the tank mixture, using calcium caseinate spreader at the rate of 0.5 lb. to 100 gal. of water, showed a deposit of 22 mg. of oil. All tests were made with 2 per cent of actual oil in the spray."

[Report of work in economic entomology at the Missouri Station], L. HASEMAN ET AL. (*Missouri Sta. Bul. 285 (1930), pp. 70–76*).—A preliminary study of the influence of chemical composition of the insect's food on multiplication indicated some effect. In testing home mixed insecticides and some commercial mixtures on insect pests of melon and related crops, the best control and least injury to the crops occurred where a dust mixture consisting of 1 lb. of calcium arsenate and 15 lbs. of land plaster or gypsum was applied regularly from the time the plants came up until they began to vine and blossom.

A study made of the yearly variations in codling moth emergence, factors influencing this variation, and the timing of each spray by the actual emergence of the moths each year, carried on at Marionville and St. Joseph is reported upon in tabular form.

A study of insect pests of the sunflower, a crop of considerable importance in southeastern Missouri, was made in cooperation with the U. S. D. A. Bureau of Entomology at the Webster Groves laboratory. Much of the damage appears to have been done by four species, namely, two stalk borers (*Suleima helianthana* and *Rhadobaenus 13-punctatus*), the seed weevil, and the webworm on blossom and seeds, though more than 100 species of minor importance have been identified.

In the use of dusts by K. C. Sullivan for the control of apple insects, the details of which in the Riverview Orchards at McBaine are presented in tabular form, they were found to give very satisfactory results in the control of the codling moth. It is considered that a judicious use of the dusts as a supplement to the regular liquid sprays in combating the codling moth seems advisable in view of the present prevalence of the pest and the spray residue problem.

A list is given of the number of nurseries infested by the more important nursery insects, which is led in importance by leafhoppers and followed closely by leaf skeletonizers, the work being done by Haseman and G. D. Jones.

In a study of the biology of the strawberry crown borer and its control, by Sullivan, methods of rearing the pest under control conditions were perfected. Adult females began depositing eggs at Columbia during the middle of April, a few days following fertilization. Mating may continue after egg laying begins, but it is not necessary in order to obtain fertile eggs. Egg deposition began in the field at approximately the same date as in the laboratory. Females which began depositing eggs in April were still laying on July 6. They deposited an average of an egg every other day. The incubation period varied from 11 to 21 days. The length of the larval and pupal stages have not been definitely determined. Control experiments were conducted at Sarcoxie, Lebanon, and Columbia, the details of which are given in tabular form.

[Notes on economic insects and control measures] (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 321, 464–470*).—The contributions here presented are as follows: A Wild Host of *Mineola scitulella*, by H. J. Pack and V. Dowdle (p. 321); The Predaceous Habit of *Cyrtopeltis varians* Dist., by O. W. Rosewall and C. E. Smith (p. 464); Experiments with Codling Moth Bands Treated with Lead Arsenate, by R. H. Smith (pp. 464, 465); Grasshoppers vs. Salt, by A. P. Morse (p. 465); The Lesser Corn Stalk Borer (*Elasmopalpus lignosellus* Zell.) Attacking Strawberry Plants, by C. F. Stahl (p. 466); Spray Coverage, by H. W. Anderson, W. P. Flint, M. D. Farrar, and M. A. Smith (pp. 466–469); and A Factor Concerned in Arsenical Injury to Foliage, by S. F. Potts (pp. 469, 470).

[Papers on economic insects and their control] (*Peninsula Hort. Soc. [Del.] Trans., 42 (1929), pp. 75–94, 107–124, 154–156, figs. 10*).—The papers presented at the annual meeting of the Peninsula Horticultural Society, held at Camden, Del., in January, 1929, include the following: Further Results with Fish Oil as an Adhesive, by H. L. Dozier (pp. 75–79), previously noted (E. S. R., 61, p. 248); The Oriental Peach Moth, by G. J. Haeussler (pp. 80–86); Some Phases of Codling Moth Control, by T. J. Headlee (pp. 87–94); The Japanese Beetle Quarantine in Relation to Delaware, by C. H. Hadley (pp. 107, 108); Control Measures for the European Red Mite on Peach and Apple, by E. N. Cory (pp. 109, 110); Life History Studies of the Plum Curculio, by H. G. Butler and H. L. Dozier (pp. 111–117); Life History and Control of the Grape Berry Moth in Delaware, by H. L. Dozier and H. G. Butler (pp. 118–124); and The Mexican Bean Beetle and the Control of the Red Spider on Strawberries, by E. N. Cory (pp. 154–156).

Insect pests of willows, H. P. HUTCHINSON and H. G. H. KEARNS (*Nature [London], 125 (1930), Nos. 3145, p. 201; 3147, p. 276*).—A brief reference is made to studies of the life history, habits, and means of control of the principal willow pests in Great Britain under way at the Research Station at Long Ashton, Bristol.

The rice weevil and associated insects in relation to shuck lengths and corn varieties, O. L. CARTWRIGHT (*South Carolina Sta. Bul. 266 (1930), pp. 28, figs. 8*).—Studies of the rice weevil at Florence, S. C., extending over a period of three years indicated that about 95 per cent of the ears and 10 per cent of the grains were infested or had been damaged by insects by the time the corn was removed from the field. Entrance by the corn ear worm was followed by increased infestation by the pink corn worm (*Pyroderces rileyi* Wals.), the Angoumois grain moth, the rice weevil, and the flour beetles *Cathartus cassiae* Reiche and *Tribolium ferrugineum* Fab.

The length of shuck beyond the tip of the ear was an important factor in the development of infestation. The infestation by each insect varied inversely with the length of shuck. The ear worm entered 97.3 per cent of the ears in 1928 and 96.5 per cent in 1929. A difference of 3 in. in length of shuck decreased ear worm damage about 5 to 10 per cent, pink corn worm damage approximately 10 per cent, rice weevil 23 per cent, and Angoumois grain moth 6 per cent. Shuck length in all corn varieties had been increased since 1925, yet only two varieties averaged over a 3 in. tip shuck. Only one had less than 10 per cent with tip shuck under 1 in. Varietal resistance to corn ear worm, pick corn worm, Angoumois moth, and flour beetles was negligible. One and possibly two other varieties showed comparative unattractiveness or resistance to weevil damage.

A study of the lesser migratory grasshopper, R. L. Shotwell (*U. S. Dept Agr., Tech. Bull. 190 (1930), pp. 35, figs. 13*).—The account here presented is based upon observations made in the field in Montana during the period from November, 1923, to November, 1927, and in the laboratory, supplemented by excerpts from the literature.

Melanoplus atlanis (Riley) [=*M. mexicanus* (Saussure)] occurs in practically all parts of the United States from sea level to an altitude of 14,000 ft., over practically all but the tropical lowlands of Mexico, and extends north into Canada. Its greatest damage has been done west of the Mississippi, and especially in the northern hard spring wheat area, including the Provinces of Canada from Manitoba westward. It is considered as probably the most important species of grasshopper that occurs in the United States. Studies of its life history and habits are considered at length. It passes through five and sometimes six instars in its nymphal development. Mention is made of its numerous predatory and parasitic enemies, of which latter the hymenopterous egg parasite *Scelio calopteni* Riley and the sarcophagid fly *Sarcophaga kellyi* Ald. are specifically recorded. Poison bran mash used during the nymphal stage is an effective control measure.

A list is given of 31 references to the literature.

"Alfalfa plant bug," a common name for an introduced European bug (Adelphocoris lineolatus Goeze) found in Iowa (Hemiptera, Miridae), H. H. Knight (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 331–334*).—The author records the collection of a European plant bug, *A. lineolatus*, at Ames, Iowa, June 18, 1929, it being the first record of its occurrence in the United States, having been previously known from North America only from Cape Breton Island. The name alfalfa plant bug is proposed for this pest.

"Extensive scouting shows that the bug was breeding over a limited area only, with Ames and Des Moines near the center of distribution. It appears to be a clear case of accidental introduction within the past three or four years. In Iowa it has been found breeding only on alfalfa and sweetclover, but in such numbers that it suggests the possibility of becoming a pest."

Derris as a remedy for the tobacco aphid (Myzus persicae) in Deli [trans. title], J. Kuijper et al. (*Meded. Deli Proefsta. Medan, 2. ser., 58 [1928], No. 2, pp. 61, pls. 2, Eng. abs. pp. 54–58; abs. in Rev. Appl. Ent., 17 (1929), Ser. A, No. 6, pp. 346, 347*).—A water extract of the roots of *D. elliptica* has proved an excellent insecticide for use against the green peach aphid. This is a serious enemy of tobacco in Deli, Sumatra.

The bee moths, F. B. PADDOCK (*Jour. Econ. Ent., 23 (1930), No, 2, pp. 422–427*).—This is a summary of information on the bee moths (the wax moth and *Achroia grisella* Fab.), an earlier account of which has been noted (E. S. R., 60, p. 65).

The biological strains of Hessian fly, R. H. PAINTER (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 322–326*).—The author's studies at the Kansas Experiment Station tend to show that the Hessian fly population of any one locality consists of a mixture of two or more genetically distinct strains which differ in their ability to infest various wheat varieties.

Observations on the biology of the Hessian fly, R. H. PAINTER (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 326–328*).—In work at the Kansas Experiment Station in which individual histories of the eggs of Hessian fly laid on different leaves were followed, it was found that no flaxseed survived from eggs laid on the outer (first leaf), 6.35 per cent survived from eggs laid on the second leaf, and 45.4 per cent survived from those on the third (central) leaf. This decrease in survival on the different leaves is paralleled by the increase in deposition of cellulose, or perhaps with some condition arising with it. These facts are of interest in connection with the resistance of certain cereals to the attack of Hessian fly. The progeny from isolated single pairs of fly were predominantly of one sex. Out of 13 matings, 4 gave all males, 5 all females, and 4 offspring predominantly of one sex. In one case, 74 females and no males were reared from one pair.

The Hessian fly larva and its method of taking food, L. HASEMAN (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 316–321, pls. 2, fig. 1*).—The author finds that the larva of the Hessian fly has a perfect digestive tract, similar to other fly larvae. It takes only liquid food, the mouth organs seeming well fitted for taking food from the plant tissues. This study of its digestive tract fails to explain why it is able to mature more successfully on one strain of wheat than on another.

Preliminary studies on Arkansas horse-flies, H. H. SCHWARDT and D. G. HALL (*Arkansas Sta. Bul. 256 (1930), pp. 27, figs. 14*).—This is an account of studies made with a view to determining which species of Tabanidae are of the greatest importance in Arkansas, when they are present in greatest numbers, and the conditions that favor their abundance. Their relative importance was determined by quantitative collections made periodically during the years 1928 and 1929; collections and observations were made in various parts of the State during a period of three years. The principal collecting stations were Stuttgart, in the rice area of east central Arkansas, and Fayetteville, in northwest Arkansas, occasional collections having been made in eight other counties.

A list is given showing the seasonal abundance of 10 species found to occur in Arkansas County and of 24 species found in Washington County. Both the earliest and latest dates at which they were taken and the periods of greatest abundance are recorded. Of the 10 species taken in the rice section *Tabanus costalis* and the striped horsefly (*T. lineola*) make up 83 per cent of all the tabanids collected in the county in 1929. Of the remaining 8 species which constitute 17 per cent of the total, only 3, namely, the black horsefly (*T. atratus*), *T. sulcifrons*, and *Chrysops flavidus*, are of any consequence. Of the 26 species of tabanids taken in Washington County, located in the Ozark region in the northwestern part of the State, 72 per cent of the individuals represented *T. costalis*. The striped horsefly, next in abundance, comprised only 9 per cent of all the tabanids taken in the county, but this species is of considerable importance because it occurs very early in the spring and is present until October. It has been taken in several locations where no other species has been observed.

Among the small horseflies of the genus Chrysops only one species was observed in outbreak proportions, namely, *C. parvulus*, which appeared in enormous numbers in an apple orchard at the station farm in July, 1929. It was observed on several occasions that an area of only a few acres may have a tabanid fauna very different from that of an area of similar size situated near by. The fauna of three small areas in Washington County, as observed in 1928–1929, is shown in tabular form.

Of the 8 genera of Tabanidae known to occur in the United States, representatives of only 3 have thus far been collected in Arkansas, namely, Chrysops with 9 species, Tabanus with 20 species, and Goniops with the single species *G. chrysocoma*. Keys are given to the genera of Tabanidae found in the United States and to the Louisiana and Arkansas species of Chrysops and Tabanus. Brief notes are given on the occurrence, importance, and habits of the species so far observed in the State.

The toxicity of copper to the potato leafhopper, D. M. DeLong, W. J. Reid, jr., and M. M. Darley (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 390–394, fig. 1*).—This is in continuation of work noted from another source (E. S. R., 63, p. 255).

"Copper sulfate solutions of known strength containing 5 per cent sugars were fed to potato leafhopper (*Empoasca fabae* Harr.) nymphs through capping membranes. Dilutions to and including a 1:6,500 (0.0012 N) gave a rather high degree of toxicity. These nymphs lived for an average of 12 days upon a 5 per cent sugar solution and an average of 3 days upon distilled or tap water. The supernatant fluid from a 4–6–50 Bordeaux mixture obtained after 2 hours' setting, combined with 5 per cent sugar, gave a 14-day average survival. Roots of bean plants were placed in different dilutions of copper sulfate solutions, and leafhoppers were allowed to feed upon these plants. A high rate of mortality was obtained in these tests, and copper was found by chemical tests to be present in the plant juices of these leaves. Spray solutions of copper sulfate and of calcium hydroxide were used on different plants, and nymphs were placed on each of these. The copper sulfate treated plants showed considerable toxicity, while the calcium hydroxide did not affect the leafhoppers."

The onion maggot (Hylemyia antiqua) in Ohio, 1929, M. P. Jones (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 394–398, pl. 1*).—An account is given of sprayers devised for use against the onion maggot on the larger Ohio marshes. Applications of Bordeaux oil emulsion and the proprietary oil emulsions gave about 45 per cent increase in yield.

Wireworm control in Maine, J. H. Hawkins (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 349–352*).—An account of control work conducted by the Maine Experiment Station with wireworms, particularly the wheat wireworm, a serious pest of crops in that State. An upland species of the genus Melanotus is second in importance. Certain cultural practices and immune crops have been found to be effective in checking wireworm infestations.

A study of field practices as related to wireworm infestations (Elateridae), H. R. Bryson (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 303–315*).—Studies conducted at the Kansas Experiment Station from 1924 to 1929, inclusive, show that the percentage of corn plants injured by wireworms is influenced by the rate, date, and method of planting corn. Corn grown on land which had been cropped continuously to corn for 19 years showed less wireworm injury than that grown in various rotations. The studies indicated further that the sequence in which crops are grown in rotations, as well as the tillage methods employed in the preparation of the seed bed, influence the amount of wireworm injury that may be expected.

The feeding rate of the Australian lady beetle, Rodolia cardinalis, A. W. Cressman and J. O. Dumestre (*Jour. Agr. Research* [U. S.], *41* (*1930*), *No. 3*, *pp. 197–203*, *figs. 5*).—A report of a study of the efficiency of the Australian lady beetle (or Vedalia beetle), *R. cardinalis* (Muls.), as a predator of the cottony cushion scale, conducted at New Orleans. Its daily feeding rate was found to be influenced by the temperature, age, seasonal change, and sex. Both internal and external stimuli were involved, the quantity of food consumed varying with the rate of egg production.

"The effect of temperature was an indirect one, operating through the response to thermal change of activities which condition feeding. A pronounced seasonal change was observed, the beetles feeding at an increased rate from May through August, as compared with the rate from September to April. The effect of age was such that the quantity of food consumed is lowest during the first tenth of the life span, rises to a maximum during the third, then shows a slight decrease. No systematic change was noted in 11 successive broods reared in the laboratory, but a marked difference was found in a stock taken from the field. Observations made every four hours showed the periodic nature of the feeding process. These diurnal fluctuations were modified under constant light."

Anatomy and physiology of the digestive tract of the Japanese beetle, M. C. Swingle (*Jour. Agr. Research* [U. S.], *41* (*1930*), *No. 3*, *pp. 181–196*, *figs. 4*).—This is a report of a study made of the anatomy and histology of the alimentary tract of the Japanese beetle, the H-ion concentration, and the digestive enzymes, conducted with a view to determining its ability to digest certain classes of foods.

"It was concluded that in the alimentary canal of the Japanese beetle there are no regions where the contents are acid. The contents of the canal are very weakly alkaline, being almost neutral in the fore-gut and increasing in alkalinity as they approach the colon. The H-ion concentration may vary slightly with the food eaten, but not to any great extent. The greatest variation is found in the postmid-gut, but as fats and proteins are digested here this variation may be due to different stages in digestion. The contents of the rectum are alkaline, but on exposure to the air in the form of feces they soon become acid.

"No starch digestion could be demonstrated in the digestive system of the Japanese beetle. Maltose and sucrose are broken down into monosaccharides by the relatively strong enzymes maltase and invertase, respectively, which are secreted in the fore-gut, the premid-gut, and the postmid-gut. Fats are broken down into the fatty acids by a single enzyme, lipase, which is secreted by the premid-gut and the postmid-gut. Proteins are broken down into proteoses, peptones, peptides, and amino acids by the enzyme tryptase, which is secreted by both parts of the mid-gut. Peptase was not found in the digestive tract. Secretion is carried on exclusively by the cells in the epithelial layer of the digestive tract of the Japanese beetle, as there are no specialized secretory glands in any part of the tract."

Control of the mountain pine beetle in lodgepole pine by the use of solar heat, J. E. Patterson (*U. S. Dept. Agr., Tech. Bul. 195* (*1930*), *pp. 20*, *figs. 11*).—This bulletin describes the development of the solar-heat method of bark beetle control, records the salient details of the experimental field work, and discusses the practical application of the method on the Crater Lake Park control project. This method consists primarily in utilizing direct sunlight to kill broods of beetles in the inner bark of thin-bark trees, thus eliminating the necessity for peeling them. It has been found particularly effective in treating broods of the mountain pine beetle in lodgepole pine logs. The method has also been used, with modifications, in treating other pines infested with other species of bark beetles.

It has been found that the temperatures between 110 and 120° F. are critical, and that any temperature within this range will kill the broods if maintained 2 or 3 hours. Temperatures under 110° are ineffective. Bark temperatures of 120° or higher will kill insects with a minimum exposure of 20 minutes. Bark temperatures as high as 140° were registered when the air temperature was 89°, indicating that the mean difference between air temperatures and the concurrent bark temperatures is about 40°. Killing temperatures are registered in the bark of logs exposed to direct sunlight and lying north and south, during the hours from 10 a. m. to 4 p. m., when the air temperature is 80° or higher.

"The effectiveness of the method has been demonstrated by the successful treatment of over 9,000 lodgepole pines infested with broods of the mountain pine beetle in Crater Lake National Park, Oreg. The meteorological data given apply specifically to elevations ranging between 5,500 and 6,300 ft., at 43° north latitude. The essential points in the application of the method are as follows: Logs should lie north and south and in contact with the ground. They must be limbed and topped and the brush piled or scattered away from the logs. The logs must be fully exposed to the direct rays of the sun during midday for a period of from two to five days. After the first exposure they must be turned one-half over in order to expose the other side. On north slopes it may be necessary to place the logs east and west and turn them twice, 120° each time.

"As compared with the burning treatment, the solar-heat method is cheaper, unless the slash is thoroughly cleaned up, when the cost is the same or slightly higher. When the limbs only are burned the two methods are on par as to cost. The main advantages of the solar-heat treatment are that no standing trees are scorched and no conditions attractive to insects are set up by the work, as is the case when the logs are burned. Its principal disadvantage is that ordinarily more slash is left in the forest, unless it is burned later at additional expense. Both methods are effective in killing the beetle broods."

Notes on the life history of the clover root curculio, Sitona hispidula Fab., in central Illinois, J. H. Bigger (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 334–341, pl. 1*).—Notes are given on the biology of this curculio, which is a potentially serious pest of clovers and alfalfa.

Transportation of the alfalfa weevil by railway cars, G. I. Reeves (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 329–331*).—A recent study of the occurrence of the alfalfa weevil in alfalfa meal and meal mills, as well as its travel in freight cars, loaded and empty, is said to cast grave doubt upon the efficacy of certain well-established methods of preventing the spread of the pest.

Occurrence of the weevil Phyrdenus muriceus (Germ.) in Arizona, H. R. Brisley (*Pan-Pacific Ent., 6 (1930), No. 3, pp. 127, 128*).—Observations of an infestation of eggplant by *P. muriceus*, made by the author in central Arizona during the summer of 1929, led him to conclude that should the species become established its ravages would prevent the growing of eggplant on a commercial scale, unless adequate control measures be devised.

The pea weevil problem, F. E. Whitehead (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 398–401*).—In work at Stillwater, Okla., weevil infested peas were planted under weevil tight cages and grown to maturity without infestation occurring, indicating that the weevil planted in seed is not the source of infestation. By overwintering in protected places out of doors as high as 87 per cent were carried through the winter, showing it to be possible for a high percentage of weevil, escaping from peas before storage, to overwinter out of doors and be a source of infestation.

Variations in time of development of the honey bee, V. G. MILUM (*Jour. Econ. Ent.*, *23* (*1930*), *No. 2*, *pp. 441–447*, *figs. 2*).—"Studies made at the Wisconsin Experiment Station in 1924–1925 show variations, partly correlated to temperature, in the period from egg laying to capping of worker brood cells from less than 8 days to more than 11 days, majority being capped between the eighth and ninth days. Variations for complete development ranged from less than 19⅞ days to more than 24 days. One set of experiments showed approximately 75 per cent of 4,094 workers completing their development in less than 21¼ days. In another more definitely controlled set of 2,602 individuals, 94 per cent emerged in less than 21 days with an average developmental period of approximately 20½ days."

The rate of growth of worker, drone, and queen larvae of the honeybee, Apis mellifera Linn., H. A. STABE (*Jour. Econ. Ent.*, *23* (*1930*), *No. 2*, *pp. 447–453*, *figs. 2*).—This is a report upon the growth rate of honeybee larvae, which was determined by weighing larvae individually or in groups at definite age intervals from hatching till maximum size was reached.

Bee hive temperatures, G. H. VANSELL (*Jour. Econ. Ent.*, *23* (*1930*), *No. 2*, *pp. 418–421*, *figs. 2*).—It is pointed out that at Davis, Calif., special winter protection appears to be extremely valuable from the standpoint of pollinization but of little use in honey production locally.

Studies on the sugar content and yield of nectar from different varieties of Gladiolus primulinus, O. W. PARK (*Jour. Econ. Ent.*, *23* (*1930*), *No. 2*, *pp. 438*, *439*).—In studies made at the Iowa Experiment Station upon nectar from more than 25 varieties of *G. primulinus*, it was shown that while the percentage of sugar in nectar from different varieties varied within comparatively narrow limits certain varieties characteristically yielded two and three times as much nectar as did certain others.

Variation in the concentration of floral nectars, O. W. PARK (*Jour. Econ. Ent.*, *23* (*1930*), *No. 2*, *pp. 440*, *441*).—This is a preliminary report from the Iowa Experiment Station on the extent to which variation has been found in the concentration of floral nectars.

Studies of methods used to detect heated honeys, G. H. VANSELL and S. B. FREEBORN (*Jour. Econ. Ent.*, *23* (*1930*), *No. 2*, *pp. 428–431*).—"'Overheated' honeys have been detected by the absence of active diastase and the Fiehe test, which measures the amount of hydroxymethyl-furfural. Diastatic activity is apparently dependent on the amount of pollen present in the honey, and the absence of pollen may be the cause of condemning some honeys as overheated, such as navel orange and alfalfa. Heat produces a furfural reaction in honey, but the same reaction may be produced without heat by 30 minutes' contact with concentrated hydrochloric acid. Storage or possibly crystallization play important rôles in producing positive furfural reactions, particularly in extracted honeys, if sufficient time is allowed. The Fiehe reaction is not a reliable test for overheating, nor is the diastatic activity unless the pollen count is taken into consideration."

Further observations on the deterioration and spoilage of honey in storage, G. E. MARVIN (*Jour. Econ. Ent.*, *23* (*1930*), *No. 2*, *pp. 431–438*, *pl. 1*).—"Honey deteriorates after being extracted from the combs, and the time of extracting and conditions under which honey is stored affect the rate of change. Fermentation, caused by sugar tolerant yeasts, is one cause of deterioration [E. S. R., 59, p. 461]. When honey granulates, conditions are brought about which are conducive to the growth of these organisms. Carbon dioxide, rarely over 5 per cent alcohol, and a nonvolatile acid are the by-products of fermentation which cause the off flavor to fermented honeys. Honey which is to be sold in small containers should be heated to 160° F., pailed, and sealed while hot to prevent fermentation. The honey should then be cooled down suddenly, for if held at high temperatures for some time it will become slightly darkened. Honey in storage which has never been heated should be kept at temperatures below 52° to prevent fermentation and color changes."

Preliminary report concerning factors related to certain of the growth phases of Bacillus larvae, A. P. STURTEVANT (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 453–459*).—In the author's investigation it was demonstrated that within certain lower limits, as yet not definitely determined, the smaller the seeding of spores of *B. larvae* on a given culture medium the longer is the incubation period necessary to obtain germination and vegetative growth. It is pointed out that this may account for discrepancies between reports of cultures made of scales from combs subjected to sterilization processes and apiary results.

Some experiences in breeding Trichogramma minutum Riley, G. M. LIST (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 342–348*).—An account is given of two years' experience in breeding this egg parasite at the Colorado Experiment Station by the use of the Angoumois grain moth.

A simple and effective ant trap for household use, R. T. COTTON and G. W. ELLINGTON (*Jour. Econ. Ent., 23 (1930), No. 2, pp. 463, 464, fig. 1*).—Directions are given for making a simple but effective ant trap for use in houses that was devised while suppressing an outbreak of the little red ant or Pharaoh's ant, *Monomorium pharaonis* L.

ANIMAL PRODUCTION

Recommendations of the Bureau of Animal Industry on problems of livestock production, J. R. MOHLER (*U. S. Dept. Agr., Misc. Pub. 81 (1930), pp. 14*).—The views and recommendations of the Bureau of Animal Industry, U. S. D. A., on the breeding and improvement of livestock, care and management, control of diseases and parasites, and general information concerning the work of the Bureau are presented in this pamphlet.

Animal breeding, L. M. WINTERS (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 2. ed., rewritten, pp. X+389, figs. 104*).—A revised and enlarged edition of this treatise, previously noted (E. S. R., 53, p. 267).

Registry books on farm animals: A comparative study, C. S. PLUMB (*Columbus: Ohio State Univ. Press, 1930, pp. IX+306, figs. 10*).—In this treatise the author lists the herd, stud, and flock books that are or have been maintained in behalf of purebred cattle, horses, sheep, and swine. A discussion of the various publications serves to advise the reader as to the usefulness of each publication.

[Nutrition studies at the Missouri Station] (*Missouri Sta. Bul. 285 (1930), pp. 25–27, fig. 1*).—Results of two studies are noted.

Nutritional requirements of the rabbit, A. G. Hogan, W. S. Ritchie, and R. Boucher.—Rabbits on a ration of ground oats, whole milk powder, codliver oil, and salt, 59:38:2:1, consumed it readily for a short time, but suddenly developed paralysis of the hind legs and in a few days were completely paralyzed. Their appetites failed, and if severely affected they never recovered, even when offered entirely adquate rations. When supplemented ad libitum with either alfalfa or fresh carrots, this ration proved adequate.

Nutritional requirements of poultry, A. G. Hogan, C. L. Shrewsbury, and J. E. Hunter.—A ration of purified protein, carbohydrate, fats, mineral salts, and the usual vitamin carriers proved unsatisfactory for chicks. In some cases very slow growth was the only indication of abnormality, while in other cases symptoms resembling polyneuritis developed. An increase in the vitamin B (yeast) content of the ration caused some improvement, but the results were not consistent. The administration of Osborne-Wakeman vitamin B concentrate caused chicks to grow rapidly for two or three weeks, but this period of growth was followed by collapse, and the fastest growing chicks appeared to be the worst sufferers. An examination of the internal organs of these chicks showed that the adrenal glands were frequently enlarged, and an analysis of the blood showed a frequently abnormally high blood sugar content. Since these observations indicated a deficiency of vitamin B, a group of chicks were given a ration containing 40 per cent of yeast, and with but few exceptions they grew rapidly and were normal in all respects. A ration containing 15 per cent of yeast, supplemented with 10 per cent of a water extract of yeast, produced normal growth, as did also a ration containing 20 per cent of the water extract and no yeast.

Growth and development with special reference to domestic animals.—XIII, The influence of certain geographical and historical conditions on the physical development of Lombardy, Brown Swiss, Brittany, Dairy Shorthorn, Ayrshire, and Beef Shorthorn breeds of cattle, J. ASHTON (*Missouri Sta. Research Bul. 141* (*1930*), *pp. 67, figs. 34*).—Continuing this series of studies (E. S. R., 60, p. 67), the author describes the results of a historical investigation of the development of the Lombardy, Brown Swiss, Brittany, Ayrshire, and Shorthorn cattle. Measurements of height at withers, heart girth, distance from shoulder to ischium, distance from shoulder to hips, distance from withers to hips, width of hips, and length of head were made on more than 1,500 head of cattle. In addition the investigation included a study of the conditions of environment, both natural conditions and those created directly or indirectly by man, which may have been factors in molding the characteristics of the breeds.

In general it appeared that the size and volume of the various European breeds varied according to the quality and nature of the soil. In temperate climates one of the limiting factors was the supply of calcium and phosphorus in the feeds. The natural lack of these mineral elements in that part of the country where they were evolved was the cause of the dwarfed size of the Brittany cattle. On the other hand, the Brown Swiss breed, produced in a region where the mineral content of the soil was high, was characterized by strong skeletons and robust constitutions. The Ayrshire breed, produced in a region naturally deficient in calcium and probably in phosphorus, has had man-made environment introduced into its evolution. The use of calcium and phosphorus fertilizers has corrected the natural acid conditions of a greater part of the land, and the use of cotton cake and bean meal in winter rations has played a considerable part in making up for the natural mineral deficiencies. The Dairy Shorthorn breed was produced in a naturally rich land rather high in the mineral elements which form bone.

The author also observed a correlation between the size of the cattle and other domestic animals and the size of the people who breed them.

Growth and development with special reference to domestic animals, XIV (*Missouri Sta. Research Bul. 142* (*1930*), *pp. 30, figs. 25*).—This continuation of the series noted above is divided into two parts, as follows:

(A) *Measurements of growing Holstein and Jersey cattle on Missouri farms*, A. C. Ragsdale and M. J. Regan (pp. 3–12).—In this study measurements of height at withers, heart girth, width at hips, withers to a line between the hips, and point of shoulder to ischium were made on a large number of Holstein and Jersey cattle of different ages in representative herds in the State. Other measurements accumulated by the station were included with the above data, and the results were plotted in graphs.

It was found that the majority of the farm-reared animals were smaller at puberty and at calving time than animals of similar age in the herds at the station and at several other mid-western universities and of leading breeders of cattle. Since these differences were overcome with advancing age, it was evident that the early difference was not due to heredity but to underfeeding. Retardation of growth at this period was wasteful of maintenance cost, postponed the productive period, and came at the age when growth is most economical. Heifers are usually bred at a given chronological age, more or less regardless of physiological or developmental age, further retarding growth by the subsequent lactation.

It is concluded from this study that it is economical to grow calves at the maximum rate and to breed them when they reach about three-fourths of the mature size. By following this practice the animals mature earlier, freshen earlier, and probably have a longer and more economical productive life.

(B) *Tentative prediction charts for growth of cattle*, S. Brody and A. C. Ragsdale (pp. 13–28).—In part B of this bulletin, tentative prediction charts for growth of cattle have been drawn up, based on data previously reported (E. S. R., 58, p. 767).

Growth and development with special reference to domestic animals.—XV, Energy and nitrogen metabolism during the first year of postnatal life, S. Brody et al. (*Missouri Sta. Research Bul. 143* (*1930*), *pp. 208, figs. 44*).—Numerical data are presented in this publication on the energy metabolism of dairy and beef cattle, horses, sheep, and swine, with some data for chickens and rats during the first year of postnatal life. Most of the data were obtained on normally fed animals about 12 hours after feeding, but some are based on high and low planes of feeding and on fasting. Some data are presented in graphic form for the elimination of urinary nitrogen in the forms of total, urea plus ammonia, creatinine, and creatine for dairy calves. The changes in the consumption of feed with increasing age and the age changes in linear size are given for dairy calves and colts.

Some tentative interpretations of the results are presented in the text. A rather exhaustive historical review and list of references are also included.

Influence of thyroid extract and iodine on growth and development.—I, With a standard basic diet, F. E. Chidester, A. G. Eaton, and W. M. Insko, jr. (*Amer. Nat.*, *62* (*1928*), *No. 683*, *pp. 554–558*, *figs. 2*).—In studies at the West Virginia Experiment Station certain lots of rabbits and rats on a standard basic diet were given glucose, potassium iodide, and desiccated thyroid extract. The basic diet contained considerable quantities of vitamins A, B, C, and E and was also rich in minerals. The chief deficiencies were in calories and fat.

The addition of glucose apparently retarded the losses in weight occasioned by heavy iodine feeding. Iodine feeding in conjunction with desiccated thyroid speeded up metabolism tremendously, the thyroid acting as an accentuator of the food deficiencies.

The influence of the ingestion of tricaproin on the body fat of the white rat, H. C. Eckstein (*Jour. Biol. Chem.*, *84* (*1929*), *No. 1*, *pp. 353–357*).—Continuing this series of studies (E. S. R., 62, p. 458), young white rats weighing approximately 50 gm. each were placed on experimental diets for a period of 8 weeks. One lot of rats received a fat-free diet, while the other lot received the basal diet plus 15 per cent of tricaproin. An examination of the fat of these animals showed that as a result of the ingestion of tricaproin more saturated fatty acid radicals were present in the "new fat" than in the almost pure synthetic product. These results led to the conclusion that tricaproin was utilized by the rats to form new fat.

[Meat studies at the Missouri Station] (*Missouri Sta. Bul. 285 (1930), pp. 21, 22, 52, 53*).—Two studies are reported.

Factors affecting the color in muscle tissue, A. G. Hogan, W. S. Ritchie, and R. Boucher (pp. 21, 22).—Using rabbits as experimental animals an attempt was made to determine the effect of chlorophyll on the color of muscle tissue. One lot of rabbits was fed a ration with a low chlorophyll content, while a similar lot received a ration high in chlorophyll. Determinations were made of the total iron, water-soluble iron, and iron that could not be extracted by water in the muscles of the hind leg. The results showed no relation between the amount of chlorophyll in the ration and the amount of iron or pigment in the muscle.

Carcass studies, E. A. Trowbridge, A. G. Hogan, M. T. Foster, W. S. Ritchie, and J. A. Cline (pp. 52, 53).—Histological studies show that the muscle fibers of 14-month-old steers full fed for approximately 6 months were greater in diameter than similar animals fed a half grain ration and such roughage as they would clean up for the same period. The muscle fibers of the latter group had a greater diameter than those of a group fed only roughages. Glycogen was found in small amounts in the fresh muscle fibers of all animals, but none was present in refrigerated meat. True fat was found in abundance in the connective tissue of the full-fed animals, but only traces were found in the roughage-fed steers, and no true fats were found in the muscle fibers of any animal. Cold storage for short periods apparently did not change the composition of the fats.

The physical and chemical analyses and cooking tests made on a steer fed a half grain ration for 168 days during the winter and full fed for 168 days on pasture and of a steer fed a roughage ration for 168 days during the winter, grazed for 56 days, and full fed on grass for 112 days are given in tabular form.

Range beef production in the seventeen Western States, F. S. Hultz (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. XV+208, figs. 53*).—In this treatise the author presents a history of beef cattle production, together with a discussion of the essential successful ranch practices, the results of experimental work in range beef cattle production, diseases affecting range cattle, and the marketing of beef cattle.

Wintering steers in the north central Great Plains section, W. H. Black and O. R. Mathews (*U. S. Dept. Agr., Tech. Bul. 192 (1930), pp. 14, figs. 2*).—A 5-year study to compare the value of four home-grown feeds for wintering steers has been conducted cooperatively by the Bureau of Animal Industry and the Bureau of Plant Industry, U. S. D. A., at the U. S. Dry-land Station, Ardmore, S. Dak.

Grade Hereford yearling steers were divided into 4 lots of 15 head each in 4 years and 10 head each in the fifth year. During the course of the study some animals died, and the results were calculated on the basis of the number of steers remaining in the lot. The following rations were fed: Lot 1, 10 lbs. of oat straw and 5 lbs. of alfalfa hay; lot 2, 15 lbs. of alfalfa hay; lot 3, 30 lbs. of corn silage, reduced to 20 lbs. in the last experiment, and 5 lbs. of alfalfa hay; and lot 4, 15 lbs. of wheatgrass hay. The feeding periods were of 168 days' duration for 2 years and 196 days for 3 years.

Oat straw of good quality proved to be a valuable supplement to the winter's feed. During years when the oats were heavily infested with rust the feeding value was much lower. When fed in limited amounts with alfalfa hay, oat straw materially decreased the cost of wintering feeds without reducing the gains markedly. Alfalfa and wheatgrass were about equal in feeding value, the greater winter gains of the alfalfa-fed steers being more than compensated for by the greater summer gains of the wheatgrass-fed steers. Approximately the same amount of each kind of hay was needed for a winter feed.

The silage-fed steers always made larger winter gains with corresponding low gains while on pasture than the hay-fed steers. In the first experiment the silage ration was calculated to contain the same quantity of dry matter as the other lots, but drying tests showed that it contained a larger quantity of digestible nutrients than was originally intended. Even when the winter feed was reduced to 20 lbs., the silage-fed steers continued to make good gains at a lower cost per pound of gain than the steers in the lots fed hay. The silage-fed steers were usually in better condition at the end of the grazing season than the other lots.

All the rations produced satisfactory winter gains, and the animals would probably have made larger summer gains if less feed had been offered during the winter.

[Experiments with beef cattle at the Missouri Station] (*Missouri Sta. Bul. 285 (1930), pp. 47–52, figs. 3*).—The results of experiments in continuation of those previously reported (E. S. R., 62, p. 60) are noted.

Feeding baby calves, E. A. Trowbridge and H. C. Moffett.—In this study 6 lots of calves averaging 320 lbs. per head were placed on a winter ration for a period of 168 days. Lots 1, 2, and 3 were fed a half grain ration, clover hay, and corn silage, and lots 4, 5, and 6 received hay and silage only. During a summer period of 168 days, lot 1 was grazed without grain for 56 days and then full fed, lot 2 on pasture had a half grain ration for 56 days and was then full fed, and lot 3 was full fed on pasture for the entire period. The management during the summer in lots 4, 5, and 6 corresponded to that in lots 1, 2, and 3, respectively.

In the respective lots the average daily gains during the wintering period were 1.66, 1.67, 1.57, 0.78, 0.75, and 0.7 lbs. per head. The average gains during the first 56 days on grass were 13.2, 73.1, 94.3, 58.6, 86, and 143 lbs. per head, and during the last 112 days 266.4, 238.9, 242.5, 271.7, 286, and 304 lbs. per head.

Wintering beef calves, E. A. Trowbridge and H. C. Moffett.—In a study of winter rations for calves, lot 1 was full fed a half grain ration with corn silage and legume hay, lot 2 alfalfa hay and enough corn to make them gain as much as lot 1, lot 3 timothy hay and enough corn and cottonseed meal to gain as much as lot 1, lot 4 corn silage and alfalfa hay, lot 5 alfalfa hay and enough corn to gain as much as lot 4, and lot 6 timothy hay and enough corn and cottonseed meal to gain as much as lot 4. All animals received a mineral mixture at the rate of 2 oz. per head daily.

The calves in lots 1, 2, and 3 gained approximately 1.5 lbs. per head daily, and those in lots 4, 5, and 6 1 lb. per head daily. On this basis, 30 lbs. of cottonseed meal and 1,174 lbs. of corn silage fed to lot 1 replaced 120 lbs. of corn and 236 lbs. of alfalfa fed to lot 2. Likewise 559 lbs. of alfalfa fed to lot 2 replaced 60 lbs. of corn, 53 lbs. of cottonseed meal, and 553 lbs. of timothy hay fed to lot 3. In lot 4, 2,143 lbs. of silage replaced 293 lbs. of corn and 481 lbs. of alfalfa fed to lot 5, and 925 lbs. of alfalfa fed to lot 5 replaced 94 lbs. of corn, 48 lbs. of cottonseed meal, and 761 lbs. of timothy hay fed to lot 6.

Rations for native spring calves, E. A. Trowbridge and H. C. Moffett.—Steer calves running with their dams and creep fed a ration of shelled corn made an average daily gain of 1.92 lbs. per head, those receiving corn and cottonseed cake, 8 : 1, 2.13 lbs. per head, and those receiving corn and oats, 2 : 1, 2.12 lbs. per head during the suckling period. It was found that 17.4 lbs. of oats fed in lot 3 had a replacement value of 12.4 lbs. of corn and 21 lbs. of cottonseed cake when compared with lot 2. At the end of the suckling period the calves in lot 2 had returned the greatest profit over feed cost and those in lot 1 the least.

The same calves were continued on the same rations in dry lot. The cottonseed cake increased the feed consumption and the daily gains over the other two lots, but it increased the cost of feed and decreased the returns per head during this period. After being fed for 336 days in all, the calves in the respective lots weighed 862, 928, and 898 lbs. per head, and the return for the keep of cow was highest in lot 2 and lowest in lot 1.

Feeding native fall calves during the nursing and subsequent finishing periods, E. A. Trowbridge, H. C. Moffett, and E. M. Jones.—In cooperation with Sni-a-Bar Farms and the U. S. Department of Agriculture, 3 lots of fall calves were raised under different methods of management. Lot 1 ran with the dams and received no extra feed, lot 2 ran with the dams and were fed grain in creeps, and lot 3 nursed twice daily and received grain. At weaning time the expenditure of $18.40 for feed in lot 2 netted $30.37, and an expenditure of $21.87 for grain in lot 3 netted $28.07, as compared with lot 1. The grain-fed calves averaged 130 lbs. more per head and were valued at $2.50 and $2.25 more per hundredweight than those receiving no grain.

In dry lot after weaning there was little difference in the rate of gains of the different lots, but lot 1 made the most economical gains. After 140 days feeding in dry lot the calves in lot 1 were still not finished enough to class as choice slaughter cattle. For the combined periods, lot 1 returned $65.73, lot 2 $91.92, and lot 3 $82.97 over feed cost.

The value of beet pulp in the winter ration for lambs, M. T. Foster (*Missouri Sta. Bul. 285 (1930), p. 46*).—Two lots of 8 ewe lambs each that had been treated in a similar manner were placed on the same basal grain and hay ration on December 15. Lot 1 received in addition about 1 lb. of beet pulp per head daily. At the beginning of the test the average weight per lamb was 89.75 and 88.75 lbs., and at the end of the test 122 and 103.5 lbs. per head in the respective lots. The average fleece weight in the respective lots was 8.25 and 6.94 lbs. per head.

[Experiments with swine at the Missouri Station] (*Missouri Sta. Bul. 285 (1930), pp. 42, 43, 53–55*).—The results of experiments, several of which have been continued (E. S. R., 62, p. 64), are noted.

The influence of unfavorable dietary conditions on the fecundity of swine, A. G. Hogan, F. F. McKenzie, and L. E. Cassida.—Four groups of gilts were fed a basal ration of ground yellow corn, linseed meal, wheat bran, alfalfa meal, dried buttermilk, and cod-liver oil in pens where they had no access to the soil. The basal ration was supplemented with mineral mixtures varying in the different lots from a very simple to a very complex mixture. All the sows grew normally and farrowed normal litters, but the milk flow was small and only a few pigs made normal growth after they were two weeks old. Supplementing the sow's ration with skim milk stimulated the milk flow and was beneficial to both the sow and litter, while sprouted oats feeding had a rather doubtful value. When fresh sweetclover was added to the ration, normal healthy pigs were produced. One sow and her litter were moved to a bluegrass pasture, but while these pigs appeared healthy they did not grow well.

Practically all of the pigs, except the litter whose mother received the sweetclover, were anemic. A mineral mixture containing ferric oxide, copper, and manganese sulfates given to individual pigs was largely ineffective. The sows receiving iron produced somewhat better litters than the others, but the complex mineral mixture was of no apparent value.

Sudan grass as a hog pasture, L. A. Weaver.—A lot of pigs on Sudan grass pasture made faster and more economical gains than a similar lot fed on a concrete floor when both lots received corn and tankage, 12:1. No significant difference in the rate or economy of gain was found in the lot fed on Sudan grass and a similar lot on rape and oats.

The kind and amount of concentrate to feed on Sudan pasture, L. A. Weaver.—In this study 6 lots of pigs were fed on Sudan grass pasture. Lots 1, 2, and 3 were hand full fed twice daily, and lots 4, 5, and 6 were fed three-fourths as much feed as the first lots. Corn alone was fed in lots 1 and 4, corn and tankage 16 : 1 in lots 2 and 5, and corn and tankage 12 : 1 in lots 3 and 6. Corn alone was not efficient whether full or limited fed. When full fed there was little difference in the rate or economy of gain regardless of the proportion of tankage used, and the same was true when the ration was limited. The hogs full fed on corn and tankage, 16 : 1, gained 28 per cent faster but required 11 per cent more concentrates per unit of gain than those receiving the same ration in limited amounts. More pasture was consumed by the hogs receiving the limited rations.

Supplements to corn fed to hogs on Sudan grass pasture, L. A. Weaver.—A home mixed supplement composed of shorts, tankage, linseed meal, and cottonseed meal fed with corn to pigs on Sudan grass pasture produced faster and more economical gains than any of three commercially mixed feeds.

Supplements to corn for fattening hogs in dry lot, L. A. Weaver.—For hogs in dry lot, a home mixture of tankage, linseed meal, cottonseed meal, and alfalfa meal as a supplement to corn produced faster and more economical gains than two commercial feeds.

Rations for weanling pigs in dry lot, L. A. Weaver.—Weanling pigs in dry lot on a ration of yellow corn, liver meal, dried buttermilk, alfalfa meal, and a mineral mixture of ground limestone, bone meal, and salt plus skim milk or buttermilk made much more rapid gains than similar pigs on a ration of yellow corn plus a protein supplement of tankage, linseed meal, cottonseed meal, and alfalfa meal or a ration of yellow corn plus a commercially mixed feed or a ration of yellow corn plus skim milk or buttermilk. All of the above feeds were self-fed.

Individual feeding in swine experimentation, E. W. Crampton (*Macdonald Col., McGill Univ., Tech. Bul. 5a (1929), pp. 15, figs. 4*).—Continuing this study (E. S. R., 61, p. 559), 20 pigs weighing from 23 to 42 lbs. each were divided into two lots. The pigs in lot 1 were fed in individual pens, while those in lot 2 were fed together in a large pen. The ration fed in each group was the same.

In this study it was found that when 10 pigs were fed and housed as a group the average gain per unit of feed consumed was subject to a probable error of 5 per cent, regardless of the length of feeding period. Where actual data for the feed consumption of each pig were available this error was markedly reduced. The length of feeding period up to 60 days was a factor in determining the size of the probable error in the individually fed group. For this study the probable errors of the average gains per 100 lbs. of feed consumed in the individually fed group were for 10 to 20 days' feeding 3.5 per cent, 20 to 30 days' feeding 2 per cent, 30 to 40 days' feeding 1.5 per cent, 40 to 60 days' feeding 1.25 per cent, and 60 or more days' feeding 1 per cent.

Cod liver oil for growing pigs, E. W. Crampton (*Sci. Agr., 10 (1930), No. 8, pp. 523–529*).—In this study at Macdonald College, 4 lots of 10 pigs each were fed the same basal ration for 60 days. The pigs in lots 1 and 2 were each confined to separate pens throughout the test and fed individually, while lots 3 and 4 were housed and fed by lots. Cod-liver oil was fed in lots 1 and 3 at the rate of 0.5 oz. per pig daily. Each animal was fed according to appetite.

It was found that as a supplement to the basal ration fed cod-liver oil failed to affect measurably the gains of the pigs. The conclusion drawn from this study was that the feeding of cod-liver oil to thrifty, growing pigs is unwarranted.

[Experiments with poultry at the Missouri Station] (*Missouri Sta. Bul. 285 (1930), pp. 93–99*).—Results of experiments in continuation of those previously noted (E. S. R., 62, p. 67) are reported.

The relation of time of hatching to egg production, E. W. Henderson.—In this study with 225 White Leghorn pullets, no disadvantages were found in hatching at an early date. The annual egg production of 69 February-hatched birds was 177 eggs, of 105 March-hatched birds 165, of 41 April-hatched birds 166, and of 10 May-hatched birds 150. The fall and winter egg production was highest in the lot of birds hatched in February.

The use of artificial light to stimulate winter egg production, H. L. Kempster and R. R. Parks.—Artificial lighting increased the winter egg production of Barred Rock pullets 14 eggs per bird. In the unlighted pens the birds averaged 45.6 eggs from November 1 to March 1 and in the lighted pens 59.8 eggs, while from November 1 to April 30 the average production was 80 and 94 eggs, respectively. The birds in the lighted pens were heavier during November and December and lighter after March 1 than those in the unlighted pens.

The feed purchasing power of the eggs produced by one hen, H. L. Kempster.—Based on an average egg production of 122 eggs per bird and the average farm price of a mixture of 5 lbs. of corn, 3 lbs. of oats, and 3 lbs of wheat, the feed-purchasing power of eggs produced by one hen was determined for 1927 and 1928.

The use of eggs as a supplement in chick rations, H. L. Kempster.—Two lots of 100 chicks each were fed the same basal ration, and both lots were brooded behind window glass. Lot 1 was fed boiled eggs produced during the winter months when hens had limited exposure to direct sunlight, while lot 2 received eggs produced in April and July and held in storage for from 10 to 12 months. The mortality was 14 and 8 per cent in the respective lots, and no symptoms of rickets developed. There was little difference in the weight of the chicks at 6 weeks of age.

Value of dried buttermilk, meat scrap, cottonseed meal, soybean meal, and ground soybeans in rations for egg production, H. L. Kempster.—In an effort to determine the most effective protein supplement for laying hens, 8 lots of White Leghorn pullets were fed for one year on the same basal ration. The protein concentrates used were cottonseed meal or soybean meal supplemented with either rock phosphate or bone meal, tankage, meat scrap, ground soybeans supplemented with bone meal, and dried buttermilk. The average egg production per bird in the respective lots was 151, 157, 133, 129, 125, 142, 100, and 181. Eggs from each lot were placed in storage and later examined. The eggs from the lots receiving dried buttermilk or soybean meal were of fine quality, while a high percentage of the eggs from the cottonseed meal lots had discolored yolks. However, there were no objectionable odors to the eggs from these lots. The largest eggs were laid by the birds receiving dried buttermilk.

Nutritional requirements of poultry, E. W. Henderson.—Continuing this study 6 lots of 50 White Leghorn chicks each were fed the same basal ration for 6 weeks. In addition lot 1 received dried milk 5 per cent and bone meal 3.2;

lot 2 dried milk 15 and bone meal 2.4; lot 3 dried milk 25 and bone meal 1.6; lot 4 meat scrap 10, dried milk 5, and bone meal 0.8; lot 5 meat scrap 5, dried milk 10, and bone meal 1.2; and lot 6 meat scrap 15 per cent. The average initial weight of all chicks was approximately 32 gm., and the average final weight 139, 238, 256, 167, 167, 212, and 130 gm. per head in the respective lots. The highest mortality was in the lots fed 5 per cent of dried milk or 15 per cent of meat scrap, and these lots produced the smallest gains.

The relation of the date of sexual maturity to egg production, H. L. Kempster.—In a study with 200 White Leghorn pullets it was found that birds which began laying in August and September made slightly better winter and annual egg records than those which started laying in November.

The use of dried skim milk in rations for poultry fattening, H. L. Kempster and E. E. Schnetzler.—Approximately 80 birds per lot were used in this study, and each lot received the same basal ration. In addition the total ration contained semisolid buttermilk or dried skim milk to the extent of 5, 10, 15, or 20 per cent of the total. For the 10-day feeding period the gains were practically the same in the lots receiving 5, 10, or 15 per cent of dried skim milk and in the lots receiving semisolid buttermilk, but the gains in the lot receiving 20 per cent of dried skim milk were somewhat lower. In order to produce 1 lb. of gain it required 5.2 lbs. of the basal ration plus 3.5 lbs. of semisolid buttermilk as compared with 5, 6.09, 5.15, and 9.9 lbs. of the dried skim milk rations containing 5, 10, 15, or 20 per cent of the dried skim milk, respectively.

Hygiene, feeding, and management of baby chicks, W. H. Lapp and E. V. McCollum (*Baltimore: Authors, 1930, pp. [V]+138, pls. 27*).—This treatise, based on long experience by the authors, gives suggestions on the care and selection of hatching eggs, incubation, brooding, feeding, and prevention of vices and diseases of baby chicks.

The relative values of various grain mixtures for chicks, H. F. Newbigin and R. G. Linton (*Scot. Jour. Agr., 12 (1929), No. 2, pp. 164–168*).—In a study at the Edinburgh and East of Scotland College of Agriculture, 3 groups of 20 chicks each were fed under the same conditions for 55 days, and all lots were allowed free access to separated milk. In addition lot 1 received a mixture of durra, millet, canary, hemp, groats, rice, lentils, peas, wheat, and maize; lot 2 durra, millet, canary, and hemp; and lot 3 groats, lentils, rice, peas, wheat, and maize. The durra, millet, canary, and hemp were fed in the natural undecorticated state, and the mixture in each lot was made up of equal parts of each seed. Any food left at the end of a day was weighed back. After 55 days all lots were placed on the same dry mash for an additional 62 days.

At the beginning of the test the average weight per chick was 38.2, 38.6, and 38.6 gm. in the respective lots, and at the end of 55 days the average weight was 550, 445, and 520 gm., respectively. After changing to the dry mash the chicks in the second and third lots failed to make up the weight attained by the chicks in the first lot.

Laboratory incubator for the biological study of chick embryo, A. L. Romanoff (*Science, 69 (1929), No. 1781, pp. 197, 198, fig. 1*).—In this article the author describes and illustrates a laboratory incubator in which perfect control of the physical factors of incubation, such as temperature, humidity, quality of air, ventilation, and movement of eggs, is provided.

What one week may do to an egg, P. F. Sharp (*U. S. Egg and Poultry Mag., 35 (1929), No. 6, pp. 14–17, 64, figs. 4*).—In this article from the New York Cornell Experiment Station, the author describes a method for determining the interior quality of an egg. The method is based on the standing-up qualities of the yolk. For measuring, an egg is broken and the yolk separated from the white and placed on a flat glass plate. The plate is covered with an inverted glass tumbler and allowed to stand for 5 minutes. The height and width of the yolk are then measured with calipers, and the height is divided by the width to get an expression of the quality. Comparison of eggs depends upon their being measured at a constant temperature. Eggs that have been exposed to high temperatures or to other deteriorating factors have a weakened membrane, which is shown by the flattening out of the yolk. These measurements give a good indication of the treatment an egg has received previous to breaking the shell.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Missouri Station] (*Missouri Sta. Bul. 285 (1930), pp. 57, 58, 59, 62–65, figs. 2*).—These studies have been continued (E. S. R., 62, p. 70).

Analysis of the progeny performance of Jersey and Holstein sires and dams, W. Gifford.—Continuing this work the records of 75 Holstein sires and 35 Jersey sires, each having 10 or more tested daughters, have been added to the list previously noted. A study was made of groups of records representing yearly productions of fat between 300 and 1,000 lbs., inclusive, determined by the monthly test plan, to determine the reliability of the bimonthly test plan. The results are given in tabular form.

The rate of decline of milk secretion, C. W. Turner.—In this study a milking machine was devised that would milk each quarter into a separate container. Twenty cows were divided into four groups, and each group was milked by the special machine for a period of one week at a time. It was found that the average percentage of the total milk secreted by each quarter was quite constant during a lactation period. However, some individual cows deviated considerably from the average, and in these cases one quarter was found to be less persistent than the others.

Milk secretion during the first pregnancy, C. W. Turner.—In an effort to determine accurately the time of the initiation of milk secretion, 6 heifers were milked during their first pregnancy. In each case a small amount of secretion was obtained from the beginning of pregnancy, indicating the presence of some secretory tissue formed at previous oestrous cycles, and where animals had been milked previous to conception the level of secretion attained was usually maintained, although in some cases it declined. It appeared that during the early part of pregnancy the growth phase of mammary activity predominated, but at from 5 to 30 days previous to calving the secretory phase of mammary activity increased rapidly up to the time of calving. One heifer, however, began to increase her milk yield 135 days before parturition. At 100 days she produced more than 12 lbs. of milk daily and for the last 90 days before calving an average of 14 lbs. of milk per day. However, this heifer did not increase markedly in production following calving.

The composition of cow's milk prior to and following parturition, C. W. Turner.—A chemical analysis of the milk of cows that had been dry for some time and were milked daily for about 10 days previous to the expected time of calving showed that the same protein constituents, albumin and globulin, were present in large amounts, declining gradually until at calving time the composition was approximately equal to normal milk.

Dicalcium phosphate as a mineral supplement for dairy cows, C. C. Hayden, C. F. Monroe, and C. H. Crawford (*Ohio Sta. Bul. 455 (1930), pp. 26, figs. 3*).—This is a more detailed account of work previously noted (E. S. R., 63, p. 669).

The physiological effect of pituitary extract (posterior lobe) on the lactating mammary gland, C. W. Turner and I. S. Slaughter (*Jour. Dairy Sci., 13 (1930), No. 1, pp. 8–24, figs. 3*).—Continuing this study (E. S. R., 62, p. 71) at the Missouri Experiment Station, a temporary inhibition of milk secretion was found which varied with the amount of pituitrin injected as indicated by the yield of milk at the next regular milking. The size of the injection influenced the time required for the pituitrin to become effective. The greatest yield of milk was obtained after 10 minutes when 12 cc. of extract was injected, while 20 minutes was required when only 6 cc. of extract was injected.

Some factors influencing the volume of foam on milk, F. P. Sanmann and H. A. Ruehe (*Jour. Dairy Sci., 13 (1930), No. 1, pp. 48–63*).—At the Illinois Experiment Station studies were made of the influence of certain factors on the foaming ability of cow's milk. Samples of milk were tempered in beakers in water baths to the required temperatures, and then whipped for 1 minute in the beaker with an electrical stirring machine. When the agitator was withdrawn 15 seconds were allowed for the surface of the foam to come to rest, after which the total apparent increase in volume was read and calculated as a percentage of the original volume.

The largest volume of foam was produced at low temperatures. As the temperature increased the volume of foam decreased to a minimum, then rose to a second maximum lower than the first, and with continued rise in temperature again decreased. Freshly drawn milk did not have so low a minimum foaming ability as milk that had been cooled and aged. At least a part of the effect of aging appeared to depend on changes in the fat globules, and these changes were partly dependent on the temperature at which the milk was aged. The agitation of milk at low temperatures reduced its subsequent foaming ability, while agitation at a temperature high enough to cause the fat globules to be in a liquid condition increased the subsequent foaming ability.

No definite relationship was found between composition and foaming ability of milk from individual cows. However, when the influence of the individual characteristic was standardized, an increase in the fat content generally decreased and an increase in milk solids-not-fat generally increased foaming ability. At 40° F. a moderate amount of developed acidity increased foaming ability, but acidity enough to cause curdling decreased this ability. At 80° no significant change occurred until a considerable amount of acidity developed, when a slight increase was noted, but at 140° a decrease occurred as soon as enough acidity developed to produce a slight curdling.

At 40° added calcium lactate decreased and added primary magnesium phosphate increased foaming ability, but at 80° none of the added salts affected foaming ability. Calcium lactate and primary magnesium phosphate each caused a decrease in foaming ability at 140°, accompanied by a slight curdling of milk during the tempering process. Sodium citrate caused a slight decrease in foaming ability at 140°. Neither sodium bicarbonate or disodium phosphate had any effect on foaming ability.

Variations in Streptococcus lactis, B. W. Hammer (*Jour. Dairy Sci., 13 (1930), No. 1, pp. 64–68*).—In a study of variations in the action of *S. lactis* at the Iowa Experiment Station, cultures which were unusual in that they began growth in tubes of litmus milk at the top instead of the bottom were isolated. Such cultures could be split into two types, one of which differed from the original by beginning growth at the bottom of litmus milk tubes. This variation, although more like the usual *S. lactis* culture than the original, was apparently unstable and after several transfers reverted to the original type. These results indicate that each of the types can be split off from the other.

The dominance of the type developing on the surface was probably due to its comparatively rapid growth, which tended to submerge the other type.

The variations that appear to be common with *S. lactis* organisms may explain the differences that are met in cultures of these species. In all likelihood most of the variations are never conspicuous, due to such factors as competition from the original type, but occasionally the variant outgrows the original and becomes of real significance.

Observations on ropiness in butter cultures, B. W. HAMMER (*Jour. Dairy Sci., 13 (1930), No. 1, pp. 69–77*).—At the Iowa Experiment Station a transfer of a butter culture that had developed a ropy condition was plated on whey agar, and, after incubating the plates at room temperature for 2 days, 14 *Streptococcus lactis* colonies were picked into litmus milk. One of these colonies produced a very ropy condition, while the others showed no ropiness. Another transfer produced 2 ropy cultures out of 33 *S. lactis* cultures picked. Other attempts to isolate ropy cultures by plating transfers of the ropy butter culture also showed that the ropy were less numerous than the nonropy cultures.

The ropy organisms isolated differed from most *S. lactis* cultures in that they began growth on the surface of the litmus milk tubes. Ropy cultures isolated were identified as *S. lactis hollandicus*, the presence of which is presumably due to a change in the character of the organism. The factor responsible for the ropiness seems to have definitely influenced the air requirements, and, since in some cases the ropy cultures showed more chain formation than the nonropy ones, it may have affected the morphology.

[Experiments with dairy products at the Missouri Station] (*Missouri Sta. Bul. 285 (1930), pp. 65–68*).—The results of several experiments are noted (E. S. R., 62, p. 72).

Sandiness in nut ice creams, W. H. E. Reid.—In this study it was found that such nuts as almonds, pecans, and English walnuts caused ice creams to become sandy much sooner than ice creams not containing these nuts. Washing the English walnuts and later chilling them retarded sandiness slightly, but while boiling a ground sample of each kind of nut greatly retarded sand formation it entirely destroyed the flavor of the nut. Autoclaving ground samples slightly retarded sandiness but adversely affected the flavor and appearance of the nuts. Coating the ground samples with a saturated cane sugar sirup or with a 5 per cent solution of gelatin slightly retarded sand formation. A combination of fruit and nuts retarded sandiness as compared with ice creams containing no fruit or nuts. The use of large amounts of pure maple sirup or chocolate sirup retarded the development of sandiness.

The effect of gelatin on several of the properties of sweet curd cottage cheese for storage purposes, W. H. E. Reid.—In the manufacture of cottage cheese the addition of a small quantity of gelatin reduced the yield of cheese but increased the amount of solids recovered from a known volume of skim milk. Gelatin also improved the aroma, flavor, body, and texture of the cheese at the end of a storage period as compared with cheese containing no gelatin. Cheese containing gelatin and stored at 0° F. had smaller ice crystals and wheyed off less when thawed, and the shrinkage due to the expulsion of whey was almost eliminated as compared with cheese containing no gelatin.

Improved technique in chocolate milk drinks manufacture, W. H. E. Reid and M. E. Powell.—Homogenizing chocolate milk made of 7 parts of skim milk and 1 part of cocoa paste at pressures of from 500 to 1,000 lbs. greatly reduced the amount of sedimentation usually found in the bottom of bottles. Homogenizing above 1,000 lbs. pressure increased the amount of sedimentation, so that it was equal to or greater than that of the unhomogenized product.

The temperature of homogenization did not materially affect the amount of sedimentation. When cocoa paste was homogenized at 500 lbs. before being added to the milk, the amount of precipitation was decreased, but pressures above 500 lbs. increased sedimentation. Rapid cooling of the pasteurized and processed product reduced the precipitation more than slow cooling.

Adding gelatin to chocolate milk increased the viscosity and improved the body of the product, but its presence imparted a slightly slick feeling in the mouth. It was found that 0.25 per cent of gelatin produced the most satisfactory results, and this amount decreased the sedimentation. Continuous or intermittent agitation for 3 hours after cooling of the gelatinated product did not materially reduce sedimentation.

Different brands of cocoa imparted different flavors to the products, and the amount of precipitation varied with the different brands.

The effect of separation temperature upon skimming efficiency and the physical properties of cream and resultant butter, W. H. E. Reid and E. R. Garrison.—In this study milk was separated at 10° intervals ranging from 145 to 55° F. The cream was standardized to 33 per cent fat, cooled to 38°, and aged at that temperature for 24 hours. When the temperature of separation was decreased, an increase in viscosity resulted. Aging the cream also increased viscosity, the largest increase occurring in creams separated at the higher temperatures. With cream that had been aged 5 hours, an increase in surface tension was found as the temperature of separation decreased, but below 135° no effect was found on surface tension in cream aged 24 hours. For cream separated at 115° or more, aging increased surface tension, but caused only a slight decrease in cream separated below this temperature.

There was no difference in the time required to whip cream separated at from 85 to 145°, but the whipping time was increased in cream separated at from 55 to 75°. The highest overruns were obtained in creams separated at from 85 to 125°. The consistency of the creams separated at the lower temperatures was heavier than those separated at the higher temperatures. A microscopic examination showed little clumping of fat globules in cream samples separated at the higer temperatures, but many small clumps in those separated at the lower temperatures. When separated at 145° cream was free from any plug formation, while a slight plug formation was found in cream separated at 55°.

The different separation temperatures had no effect on the body, grain, or total score of butter made from the creams. The fat in the skim milk increased from 0.063 to 0.144 per cent as the separation temperature decreased from 145 to 55°, respectively.

A comparison of the volumetric and gravimetric methods for bacteriological examination of ice cream, A. C. Fay (*Jour. Dairy Sci., 13 (1930), No. 1, pp. 40–47*).—At the Kansas Experiment Station, 5 sets of dilutions were made from 10-gm., 10-cc., and 1-cc. samples of ice cream, respectively, and 10 plates were poured from the final dilution of each set to compare these methods.

The results, based on the counting of approximately 500 plates by each of the methods, showed that normal variations tend to eliminate the advantage which any one method possesses. The use of the 10-gm. sample requires more time and more careful operation than the other methods, but is advisable for an ice cream that is frothy and does not give up its incorporated air on melting. When the plate method of analysis is employed, it makes little difference whether the 10-cc. or the 1-cc. sample is used.

Color of evaporated milks, B. H. Webb and G. E. Holm (*Jour. Dairy Sci., 13 (1930), No. 1, pp. 25–39, figs. 8*).—The Bureau of Dairy Industry, U. S. D. A., made a study of the color of evaporated milk, especially the effect of various steps in the manufacturing process upon the color of the resulting product. Standards of exact known color values were used for comparison, and from these comparisons a set of permanent color standards was developed, expressed in numerical terms according to the Munsell system.

In the manufacturing process it was found that heat, whether encountered during forewarming, sterilization, or storage, produced important changes in the color. An increase in heat during sterilization deepened the color by affecting brilliance, chroma, and hue, while an increase in time and temperature of storage deepened the color by increasing chroma only. The use of sodium bicarbonate as a neutralizer deepened the color of evaporated milk in proportion to the amount used.

VETERINARY MEDICINE

[Studies in comparative pathology in Japan] (*Jour. Japan. Soc. Vet. Sci., 8 (1929), Nos. 3, pp. 145–220, pls. 2, figs. 19; 4, pp. 225–263, pls. 2*).—The contributions presented in No. 3 are as follows: Studies of the Pathogenic Anaerobe—I, Contribution: Identification of the Malignant Edema Bacillus by Agglutination [*Bacillus oedematis maligni*], by T. Konno and Y. Ochi (pp. 145–160; Ger. abs., p. 160); Preliminary Note on the Experimental Infection with the Rinderpest Virus in Susliks [*Citellus mongolicus ramosus* Thos.], by T. Inoue, S. Harada, and T. Shimizu (pp. 161–173; Eng. abs., pp. 172, 173); The Strangles Streptococcus, with Particular Reference to Its Specificity, by K. Ogura (pp. 174–204; Japan. abs., p. 204); and On the *Trichophyton faviform album* in Cattle, by H. Oguni and W. Hashiguchi (pp. 205–220; Eng. abs., pp. 219, 220).

The contributions in No. 4 are as follows: On the Hemotoxin of the Sarcosporidia, by S. Sato (pp. 225–237; Japan. abs., pp. 235–237); Studies on the Intraplantâr Inoculation of Rabic Virus—I, Experiments with Virus Fixe, by K. Itabashi (pp. 238–251; Eng. abs., pp. 250, 251); Studies of the Complement Fixation Reaction in Rabies, by S. Kondo and K. Obana (pp. 252–258; Japan. abs., pp. 257, 258); and On the Elephant Louse (*Haematomyzus elephantis* Piaget, 1880), by M. Sugimoto (pp. 259–263; Eng. abs., pp. 262, 263).

The pathogenic significance of spirochetes in some well-known pathological conditions of domestic animals, J. A. Howarth (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, pp. 630–642, figs. 7*).—This is a report of observations made by the author while engaged in a study of the microbial flora of scirrhous cord and rhinohyperplasia of hogs, the feet of sheep affected with foot rot, and thrush in horses, in the course of which special attention was given to a spirochete that was always found present under these conditions. The spirochete was located more deeply in the lesions than the other organisms, this fact suggesting its pathogenic influence and etiological relationship in the production of these diseases.

The use of salts in the production of blackleg filtrate and bacterin, J. P. Scott (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 4, pp. 525–537*).—A comparison made at the Kansas Experiment Station of the growth of anaerobic organisms in media containing 68 salts (53 inorganic salts, 9 amino acids, extractives, lecithin, and nucleoprotein) showed that in most cases there was a definite concentration of these salts which produced optimum growth. "A toxic concentration at least 100 times the optimum also was noted. The toxicity of the salts was shown to be independent of the pH. It was shown that certain salts stimulated growth, gelatinolysis, fermentation, or aggressin production, but had little action on other functions. By comparing the action of the 68 salts on the five physiological functions studied (growth, gelatinolysis, fermentation, aggressin production, and virulence), it was found possible to divide these salts into four groups: (1) Nutritive salts, (2) catalytic or general stimulating salts, (3) specific stimulating salts (gelatinolytic, fermentative, aggressive, and virulent), and (4) indifferent salts. No relationship between virulence and aggressivity could be determined.

"By the use of salts belonging to the nutritive, catalytic, and stimulative groups, a sugar free medium and a salt mixture for the production of aggressive substances were developed. By the use of the aggressive salt mixture and formaldehyde it was possible to produce blackleg filtrates and aggressins having a potency of 260 aggressive units, which is ten times as potent as ordinary blackleg aggressins and filtrates."

Carbohydrates produced by tubercle bacilli, M. Dorset and R. R. Henley (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, pp. 696–699*).—After a brief review of the literature the authors report upon their studies of a peculiar polysaccharide that has constantly been encountered in the tuberculins prepared from cultures (human type) on the sugar-free, synthetic medium previously described (E. S. R., 57, p. 771).

The principal result of the study of this polysaccharide was the isolation and identification of two sugars which take part in its structure, namely, arabinose and mannose. The culture filtrate from bovine type tubercle bacilli grown on the same synthetic culture medium yielded a polysaccharide of the same type as that obtained from cultures of the human type of bacilli. Both arabinose and mannose were found in the bovine type of tuberculin. The same two sugars, in comparatively very small amounts, have been detected in similar filtrates from the avian type tubercle bacilli. It is pointed out that perhaps other sugars may also be produced by tubercle bacilli.

Undulant fever, V. A. Moore and D. W. Baker (*Cornell Vet., 20 (1930), No. 2, pp. 211–222*).—A discussion presented in connection with a list of 32 references to the literature.

A comparison of the results of the standard macroscopic agglutination test and Huddleson's rapid method in the serologic diagnosis of Brucella infection of cattle, R. Graham and F. Thorp, jr. (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, pp. 652–659, figs. 2*).—In a comparison made of the results of the standard tube macroscopic agglutination test and Huddleson's rapid method on 6,166 samples of blood sera and milk sera, only insignificant variations developed. On 5,702 samples of bovine sera tested in parallel, the index of agreement was 0.9362, or a negligible variation of 0.064. The sensitivity of the rapid antigen suggests the advisability of frequent checking with the standard tube macroscopic test, especially in partial or doubtful reactions.

Duration of the elimination of Bacterium abortus Bang in the vaginal and uterine discharges of infected cattle, C. P. Fitch, A. L. Delez, and W. L. Boyd (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, pp. 680–685*).—In a study conducted at the Minnesota Experiment Station *B. abortus* was eliminated by discharges from the uterus through the vagina for a maximum period of 25 days following parturition at full term or abortion.

The elimination of Bact. abortus in the milk of cows, H. L. Gilman (*Cornell Vet., 20 (1930), No. 2, pp. 106–122*).—The milk from all quarters of 34 cattle was examined by the author for agglutinin content and inoculated into guinea pigs for evidence of *Bacterium abortus* infection, 9 of these animals being used twice. *B. abortus* was not recovered from milk showing agglutinins under 1:80 nor from the milk of an animal with a blood titer lower than 1:320. *B. abortus* was recovered from 53.7 per cent of the milk from quarters showing agglutinins in dilutions of 1:80 or higher.

It is tentatively assumed that quarters showing agglutinins at 1:80 or above are actively infected with *B. abortus* and may eliminate the organism at any time. Quarters showing agglutinins under 1:80 only in rare instances contain or eliminate the organism.

A list is given of 35 references to the literature.

Bang abortion disease in relation to interherd transfer of cattle, R. R. BIRCH (*Cornell Vet., 20 (1930), No. 2, pp. 123–135*).—Included in this discussion is a list of the sanitary regulations that are considered sound in combating this disease.

Bang disease control work in fourteen State institution herds, B. S. FRITZ and M. F. BARNES (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 4, pp. 490–504, fig. 1*).—A report presented at the annual meeting of the American Veterinary Medical Association held at Detroit in August, 1929, in which the progress made in control work in Pennsylvania is summarized.

Vaccination of calves against tuberculosis with Calmette-Guérin culture, B. C. G., C. M. HARING, J. TRAUM, F. M. HAYES, and B. S. HENRY (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 3, pp. 391–395*).—This contribution from the California Experiment Station is based upon investigations previously noted (E. S. R., 63, p. 172).

Two cases of malignant catarrhal fever in carabaos, M. M. ROBLES (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, pp. 702–705, fig. 1*).—A report is made of two cases of malignant catarrhal fever in carabaos in the island of Negros, P. I., so far as known the first to have been observed and reported in the Philippine Islands.

The constituents of the blood of animals as evidence of intestinal contribution to the cause of diseases of obscure origin, C. E. HAYDEN (*Cornell Vet., 20 (1930), No. 2, pp. 223–231*).—In the course of the studies here reported one case of preparturient paresis in a ewe gave very high total nonprotein and urea nitrogen readings. This case gave a calcium reading of 7 mg. per 100 cc. of blood, which is 2 mg. below the minimum of the normal standard of 9–11 mg. A second case gave a calcium reading of 8 mg. per 100 cc. of blood.

"Six stiff lambs gave a very high total nonprotein and urea nitrogen reading. The chlorides were slightly below the normal average. The same marked increase in the total nonprotein and urea nitrogen was met with in the blood of a sheep affected with icterohematuria. Other constituents of the blood in preparturient paresis and in stiff lambs would seem to indicate that the increase in nitrogen is nonrenal in origin.

"This picture is not so clear from the case of icterohematuria. There is more evidence of possible renal and liver disturbance in this case than there is in the stiff lambs and preparturient paresis. In one case of azoturia the blood constituents at onset showed a higher reading for lactic acid, amino acid, and free phenols than was indicated when the animal was on the way to recovery. This may be considered in the light of suggestive evidence only. All three or either one of these constituents might contribute to the etiology of azoturia.

"The nature of the material taken into the intestine, the condition of the intestines, and the nature of the material absorbed from the intestine all help to determine the level of the constituents of the blood stream, such as total nonprotein nitrogen, urea nitrogen, amino acid nitrogen, phenols, sugar, chlorides, and even the other organic salts. The level of some of these constituents would seem to indicate intestinal contribution to the etiology of preparturient paresis, stiff lambs, azoturia, and possibly icterohematuria."

Vibrionic abortion in sheep, R. Graham and F. Thorp, jr. (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 4, pp. 568–573, figs. 2*).—An account is given of a sporadic outbreak of vibrionic abortion in a flock of sheep in Illinois during the lambing season of 1929, in which approximately 70 of 241 ewes aborted.

Icterohemoglobinuria in sheep, P. Olafson (*Cornell Vet., 20 (1930), No. 2, pp. 232–238, figs. 3*).—An outbreak of icterohemoglobinuria in sheep in New York State, of which the etiology was not determined, is reported upon.

Anemia in young pigs, R. A. Craig (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 4, pp. 538–547, figs. 10*).—This is a summary of work conducted at the Indiana Experiment Station, a bulletin relating to which, by Doyle et al., has been noted (E. S. R., 58, p. 280).

Pulmonary edema of swine, C. Murray and H. E. Biester (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 3, pp. 349–353*).—In dealing with the mechanism of pulmonary edema and edema associated with pneumonia, it is pointed out that pulmonary edema, unlike broncho-pneumonia, rarely attacks large numbers at a time but only a few individuals with high mortality.

Studies in infectious enteritis in swine.—V, Coccidiosis in swine, and studies on Eimeria debliecki and Eimeria zurni, H. E. Biester and C. Murray (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, pp. 624–629*).—In this further work (E. S. R., 62, p. 878) experimental coccidiosis has been produced in chickens by means of sporulated oocysts of swine origin, although the avian cecal forms are not infectious for swine. "Sporulated oocysts of ovine origin did not prove to be infectious for swine. Sporulated swine oocysts administered to milk-fed calves did not produce an infection. Sporulated oocysts of bovine origin fed to pigs resulted in infection. Cultures of oocysts made after one swine passage again appeared infectious for pigs and a calf. With the technic used, the avian forms sporulated in less than 4 days; those of ovine origin in about 12 days, while the bovine and swine forms required 3 weeks or more. Although the swine and some bovine coccidia possess a similar morphology and sporulation time and can not be differentiated by direct microscopic examination, the inability to infect calves with the swine form is in accord with the conception of two or more species."

The blood in hog cholera, P. A. Lewis and R. E. Shope (*Jour. Expt. Med., 50 (1929), No. 6, pp. 719–737*).—The final sentence of the abstract previously noted (E. S. R., 62, p. 773) should read as follows:

"Consideration of the leucocytic reactions prevailing in experimental infection with *B[acillus] suisepticus*, in infectious enteritis, in swine influenza, following successful immunization against hog cholera, and following infection of cholera sick swine with secondary invaders indicates that the leucocyte count would be of aid in the differential diagnosis of hog cholera."

Experiments on immunizing young pigs against hog cholera, J. W. Benner (*Cornell Vet., 20 (1930), No. 2, pp. 159–168*).—A report of immunization work with young pigs commenced in 1922.

Blackhead associated with coccidiosis in young chicks, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, p. 705*).—Observations made at the Michigan Experiment Station indicate that coccidiosis may be a predisposing factor to blackhead in young chicks.

Brucella disease in the fowl, M. W. Emmel and I. F. Huddleson (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 3, pp. 449–452*).—This is a summary of experiments with 48 fowls extending over a period of two years and conducted in connection with those previously noted (E. S. R., 62, p. 471; 63, p. 576). The data relate to the development of agglutinins in injected birds, clinical symptoms, the macroscopic and microscopic findings in injected birds, and the isolation of the causative organism from such fowls.

An outbreak of Brucella disease in the fowl, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 4, pp. 564, 565*).—This is a contribution from the Michigan Experiment Station in continuation of work noted above. The author records the reaction of 16.5 per cent of the 90 birds purchased from a commercial flock to the agglutination test for Brucella disease in dilutions varying from 1 to 25 to 1 to 100. The importance of testing birds for Brucella disease before use in any experimental work is emphasized.

A preliminary report on the susceptibility of the turkey, pheasant, pigeon, duck, and goose to Brucella disease, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 3, pp. 452, 453*).—In experimental work in which *B. abortus* was fed and injected intravenously it was found that all of the above-named fowl are susceptible to Brucella disease, the turkey being the most susceptible, and that the same strain of the species of the genus Brucella may vary somewhat in its ability to produce Brucella disease in the various avian species.

Immunization of chickens against fowl-pox with dead, formolized, and phenolized virus, I. J. Kligler (*Brit. Jour. Expt. Path., 11 (1930), No. 1, pp. 10–13*).—It was found that fowl pox virus heated to 56° C. for 1 hour or treated with 0.5 per cent formalin solution for 4 days no longer produces lesions in susceptible chickens and also fails to induce immunity. Phenolized vaccine (0.25 per cent phenol) produced from the scab of the lesion still contained active virus 20, 25, and 50 days after the preparation, the survival of the virulence depending on the concentration of the vaccine suspension. One injection of a phenolized vaccine which no longer produces active lesions is sufficient to produce immunity. The failure of heated phenolized vaccine to produce immunity and the success obtained with the same material unheated indicates that the immunity was induced by the surviving live virus.

Merits of cutaneous vaccination against fowl-pox, H. J. Stafseth (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 3, pp. 442–449, fig. 1*).—It is pointed out that the results obtained by different workers with fowl pox immunization agree quite closely. The work has shown that cutaneous vaccination with a living virus is practical, effective, and quite safe when applied to young and healthy birds, while it is also very evident that decidedly undesirable results may be obtained from the vaccination of laying hens or birds that are ill or in poor condition from one cause or another. However, the results of vaccination are very seldom as bad as those of an outbreak of fowl pox. When this disease makes its appearance in a flock during the fall it often remains there until spring. By vaccinating flocks at the first sign of pox, the author has invariably been able to stop the outbreak in four to six weeks. The author and his immediate collaborators in this work have vaccinated about 15,000 chickens, young and old, many of them during severe winter weather, without encountering serious trouble.

The transmission of avian pox by mosquitoes [trans. title], G. Blanc and J. Caminopetros (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 15, pp. 954–956*).—Following the report by Kligler and his associates (E. S. R., 61, p. 274) that fowl pox is transmitted by *Culex pipiens*, the authors conducted transmission experiments with both fowl pox and pigeon pox. They find that *C. pipiens* can transmit fowl pox from infected to healthy cocks for at least 58 days after becoming infected and probably during the course of its life. Individuals of this species that have bitten infected pigeons transmit the disease by their bite to healthy pigeons at least 38 days after infection and probably for the period of their life. The avian pox transmitted by the bite of this mosquito follows the clinical course in the fowl and in the pigeon that is observed in nature. The bite of the infected mosquito may in the fowl and pigeon be followed by an infection not clinically detectable but sufficient to confer immunity.

Paratyphoid infection of pigeons, E. L. Brunett (*Cornell Vet., 20 (1930), No. 2, pp. 169–176, figs. 3*).—"A localized infection of the ovary and wings of pigeons was found to be due to a paratyphoid organism of the *aertrycke* type. The ovarian infection with the appearance of the infection among squabs indicates an egg-borne disease. This fact is essentially proved from a practical standpoint. The finding of the organism in the egg, however, will substantiate this statement and it is hoped that other workers will give some time to it.

"The demonstration of agglutinins in the blood stream suggests a way for the eradication of the disease. It seems that we have here a disease similar to pullorum disease of chickens. If the ovarian infection is the primary source of the disease, these individuals can in all probability be eliminated from the flock by the agglutination test."

Transmission of Bacterium pullorum infection among mature chickens, E. L. Brunett (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, pp. 667–669*).—The author found no evidence of transmission of pullorum infection in a pen of 13 reacting birds and 12 nonreacting birds with 2 nonreacting males that were kept intact for a period of 9 months. In another pen consisting of 14 reactors and a similar number of nonreactors without males, the infection was found to have spread to 1 bird. The method of dissemination was not determined.

Although in a previous experiment (E. S. R., 59, p. 880) the infection did not spread until male birds were introduced, there was no evidence that the male bird is necessary for dissemination. There is no doubt that the infection spreads between mature stock, but not with such rapidity as is generally believed.

An intradermic test for the detection of Salmonella pullora infection, B. A. Beach, C. Holmes, and C. R. Strange (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 4, pp. 557–561*).—In trial tests made at the Wisconsin Experiment Station a special pullorin detected 11.5 per cent more of the infected hens than did the agglutination test, and a second special pullorin detected 13.1 per cent more.

Some of the factors involved in the slide-method pullorum test, R. A. Runnells and L. S. Meriwether (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, pp. 643–647*).—In this study at the Virginia Experiment Station of the factors having a direct bearing upon the preparation of the antigen and upon the interpretation of the slide method agglutination test, a standard suspension or antigen was arbitrarily selected and compared with similar antigens in which several important factors were systematically varied. Among these factors were studied those that involve bacterial suspension, the medium upon which the antigen is grown, and the serum of the bird.

Studies on roup vaccination in chickens, C. Elder, F. J. Kohn, and A. M. Lee (*Wyoming Sta. Bul. 172 (1930), pp. 47, figs. 11*).—This bulletin reports upon immunization work with roup conducted in 1926–27, 1927–28, and 1928–29 with nine products, four of which were produced in the station laboratory, the details being presented in tabular and chart form. Negative results were obtained.

The forms observed in the State were nasal discharge, canker, ocular roup, pinheads, and streaks. A marked absence from chicken pox was noted. It was found that the lesions recognized by the authors as pinheads did not later develop into streaks or cankers, and that they did not appear to be stages in the resolution of cankers. Cankers sometimes appear, later disappear, and reappear in other locations. Hens over one year of age were found to be comparatively free from roup. The disease was observed to be severe during the years 1926–27 and 1927–28, when practically 100 per cent of the birds were attacked, being most severely affected in May and November. During the year 1928–29 there was almost no roup in pullets in the experimental flocks.

It is pointed out that there were heavy infections during the first two years and practically no roup infection during the third in the experimental flocks, and that if one of the five products had been used alone during the last year and no control birds left untreated favorable results for that product might have been claimed. The fact that what had usually been considered as proper ventilation was allowed during the two years of severe infestation and only limited ventilation during the third year when no roup appeared is considered a very significant factor in controlling roup infection under Wyoming conditions.

Sarcosporidiosis in a duck, F. P. Mathews (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 5, pp. 705–707, figs. 2*).—This is a report of sarcosporidiosis observed in a mallard duck received at the Indiana Experiment Station.

Infectious entero-hepatitis in the pea fowl, E. M. Dickinson (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 4, pp. 567, 568*).—This is a contribution from the Oregon Experiment Station recording the occurrence of blackhead in peafowl kept on a range with turkeys.

Dispharynx spiralis and Cyrnea colini infestation in quail, and Capillaria annulata infestation in the common fowl, F. R. Beaudette and C. B. Hudson (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 4, pp. 562–564*).—The authors record the occurrence for the first time of *D. spiralis* in quail, 17 specimens having been taken from 1 of the 4 quail received at the New Jersey Experiment Stations from Hunterdon County, N. J., in April, 1929. *C. colini*, also found present, while common in quail of the Southeastern States, from which it appears to have been introduced, has not previously been found in quail in the North. *C. annulata*, taken from a flock of 120 common fowl at Mamaroneck, N. Y., in which there had been 30 deaths, was first reported in this country by Cram in 1926 as found in turkeys in Maryland (E. S. R., 55, p. 778). It has been identified by Cram in ruffed grouse from Michigan and in chickens from Maryland (E. S. R., 59, p. 54). Infestations in chickens have also been reported in Georgia, Mississippi, and Louisiana, and more recently it has been reported by Thomas in quail in Florida (E. S. R., 63, p. 77).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Missouri Station], J. C. Wooley et al. (*Missouri Sta. Bul. 285 (1930), pp. 36–41, figs. 4*).—Experiments by Wooley and E. G. Johnson on the value of insulating board when used in the Missouri type poultry house showed that the lining appeared to affect the temperature very little. Presumably the insulating value of the lining was offset by the open front.

Tests by Wooley of the value of different varieties of wood for fence posts showed that variety is of more importance than treatment. Tests of preservative treatments showed that hot carbolineum is more effective than hot creosote when painted on. In the tank treatment with creosote the posts were submerged in hot creosote to a depth of about 30 in. for a period of 2 hours. They were then removed and plunged into cold creosote as quickly as possible. The condensation of the gases in the pores of the wood resulted in a much better penetration of creosote than otherwise would have been obtained. The 2-hour treatment resulted in an increase in the life of the fence post from 50 to over 300 per cent, depending upon the variety. It is not advisable to use a post which will not last more than 10 years. This eliminates most of the so-called softwood varieties. An inspection of the posts treated by steeping with zinc chloride and with sodium fluoride did not reveal any failures to date. The specimens of lumber treated by this process did not show sufficient decay to indicate the value of the treatment.

Data also are reported on combine harvesters, the design of poultry houses and cribs and granaries, tile drainage, and the use of electricity on Missouri farms.

Tractor hitches, H. E. Murdock (*Montana Sta. Bul. 229 (1930), pp. 34, figs. 45*).—This is a bulletin of practical information relating to suitable hitches for pulling implements with a tractor. It deals especially with adjustments for implements and hitches, 2-, 3-, 5-, and 6-implement hitches, combination hitches, and safety devices.

The combined harvester-thresher in Montana, A. E. Starch and R. M. Merrill (*Montana Sta. Bul. 230 (1930), pp. 59, figs. 42*).—The results of a survey of the combine situation in Montana, conducted cooperatively by the station and the U. S. D. A. Bureaus of Agricultural Economics, Public Roads, and Plant Industry, are reported. Many of the tables are based on the records taken in the Judith Basin during the harvest season of 1926. The results of additional experiments on the adaptation of the combine harvesting method to Montana conditions, the use of such equipment as the supplemental header, and methods of saving straw, as carried out in 1927 and 1928, are also included.

The acreage cut annually ranges from 337, which was the average for 8-ft. machines, to 1,060, the average for the 20-ft. machines. A fair rule for determining the acre capacity of a machine is to figure 0.25 acre per hour for each foot of width. The cost of operation was 13.7 cts. a bushel. The full consumption of gasoline was about 1.2 gal. an acre. As the fixed expense is high due to the first cost of the machine, it is imperative that the machine be fully utilized.

The losses in the field and in threshing are comparatively low. The field losses averaged 2.6 per cent for the combine, 3.8 per cent for headers, and 6.1 per cent for binders. The threshing losses for the combines averaged 1.9 per cent and for stationary threshers 1.1 per cent.

The supplemental header was found to enable the operator to cut costs when yields are low. The windrow pick-up and the shock pick-up enable the operator to harvest a larger acreage because the harvest season can be lengthened by cutting with a windrow or a binder until the crop is fit for combining and then coming back to windrows or shocks at the close of the season. Uneven ripening and weedy grain may also be handled by these methods.

It was found that combining should not be undertaken before the moisture content of the grain is reduced to 14 per cent.

The combine harvester in Missouri, M. M. Jones (*Missouri Sta. Bul. 286 (1930), pp. 39, figs. 8*).—The material presented in this bulletin is the result of studies of harvesting methods conducted during the harvest seasons of 1928 and 1929. The main object of these studies was to determine if the combine method of harvesting is practical and economical under Missouri conditions.

About 15 combines were used in Missouri in 1927, about 65 in 1928, and about 115 in 1929. Combines have been successfully used for harvesting wheat, oats, rye, barley, timothy, and soybeans, and also sweet, red, and alsike clover when windrowed. The 10-ft. size of combine seems to be the most popular and practical in Missouri. From 20 to 25 acres per working day during harvest season is a good average day's work. Combines of the 10-ft. size are most commonly pulled with tractors of 10 to 15 drawbar h. p. Combine owners estimate that their machines will last about 10 years.

Badly lodged grain can be picked up with a combine with less loss than with a binder. Combines generally have to travel slower in lodged grain than in grain that stands well. The difference in the grain lost by the combine method and the binder-thresher method is small. Green weeds growing up in the ripened grain were the most serious handicap to combine operations in 1928 and 1929. The windrow system of harvesting has been successfully used by some Missouri farmers in combating the trouble from green weeds, and it appears that it could be used to advantage by many others. Combined grain compares favorably in quality with grain threshed from the shock. It appears that the combine method of harvesting in Missouri is limited more by the type of farming and the acreage of small grain and seed crops than by weather conditions. In the opinion of the most of the combine owners, a farmer should have about 100 acres of small grain to justify owning a 10-ft. combine. The maximum acreage of wheat that a machine of this size should be depended on to harvest, in their opinions, is about 300.

One man on the combine and one on the tractor is the average operating crew. If the grain is sacked an additional man is required. Experience to date indicates that a crop can be harvested and threshed with a combine with no more labor than would be required to shock the grain if cut with a binder. Custom work has been found satisfactory for a number of combine owners, and also for those whose grain was so harvested. A charge of $2 per acre plus 10 cts. per bushel for combining wheat is generally considered to be fair to both parties. Average harvesting costs on acreages above 75 or 80 are lower with a combine than with the binder-thresher method. For acreages below this the binder-thresher method is usually cheaper. The average cost of harvesting with the combine method on 28 Missouri farms in 1929 was $2.02 per acre, or 21.7 cts. per bushel. The average cost of harvesting and threshing with the binder-thresher method on 93 farms in 1929 was $3.85 per acre, or 37.5 cts. per bushel.

Combining grain in weed-free fields, D. E. WIANT and R. L. PATTY (*South Dakota Sta. Bul. 251 (1930), pp. 11, figs. 5*).—This is a progress report for the year 1929 of the study of combining practices, the work being done in a weed-free field.

It was found that windrowing could be begun as early as 8 a. m. in a clean field. In windrowing clean grain a wide swath which made a heavy windrow was not objectionable as far as the drying out of the grain is concerned. The losses for straight combining and also for windrow harvesting in clean grain were less than the average binder-separator losses. There was less loss when picking up at 2 miles than at 3 miles per hour. When the windrow was picked up at a rate so fast as to tear it apart more grain was shattered and lost on the ground. A combine pulled at approximately 2 miles per hour threshed a swath 4 to 6 ft. wider than its cutting width without excessive loss in a field yielding 52 bu. per acre. When the rate of travel was increased or the width of swath increased the losses were increased, both as to shattering and threshing.

A fairly heavy windrow stayed in good condition for a month regardless of ordinary rains, while a light windrow worked down through the stubble and the grain started to grow within two weeks' time. Oats could have been direct combined any time from July 26 to August 9 without excessive loss. A study of the weed-free field would indicate that in such a field the windrowing method of harvesting was unnecessary and that direct combining of clean fields is an entirely satisfactory practice. It would indicate that green weed tips and green growth in the stubble bottom is responsible for even more of the moisture in grain that is combined direct than was anticipated.

Ventilation of farm barns, M. A. R. Kelley (*U. S. Dept. Agr., Tech. Bul. 187* (*1930*), *pp. 75, pls. 8, figs. 24*).—The results of investigations, conducted by the U. S. D. A. Bureau of Public Roads in cooperation with the American Society of Agricultural Engineers and several State agricultural experiment stations, are reported. Altogether 27 tests were made, 3 in horse barns, 1 in a hog house, 5 in barns with mixed stock, and 18 in dairy barns. Five tests were made in North Dakota, 6 in Minnesota, 1 in South Dakota, 3 in the Upper Peninsula and 2 in the Lower Peninsula of Michigan, 2 in Massachusetts, 1 in Maine, and 7 in New York State. The tests were made in the localities indicated for the reason that the ventilation problem is of greater importance in cold sections than where winters are comparatively mild, both because of the atmospheric conditions and because the greater portion of the dairy cows of the country are located in the northern and northeastern States.

Most of the tests were made in barns where the principles of the King system of ventilation were employed. Three tests were made in barns in which windows are used for intakes, that is, the Sheringham valve principle, 4 tests in barns equipped with a modified King system, and 1 test in a barn in which a fan system of ventilation was installed. Most of the barns were of frame construction with varying degrees of insulation. Concrete blocks were used in the construction of the walls in three barns.

The results showed that carbon dioxide as ordinarily encountered in stable air does not settle. The evil effects of bad ventilation are not caused by carbon dioxide as found in the average stable. There must be a constant removal of moisture from the occupied stable or the amount of moisture in the air will increase. Damp walls may be due to improper ventilation, poor construction, or insufficient production of heat or lack of conservation of heat. A large volume of air space per head is not a substitute for ventilation, as purity of air is not dependent upon volume of air space. However, the volume allowance per head is important with regard to maintenance of stable temperature and varies according to climatic conditions.

Insulation requirements vary according to the temperatures to be expected in the different sections, amount of air space which the animal must heat, the amount of ventilation desired, and the method of securing it. The amount and choice of insulating material required will depend upon the relative efficiency and cost of the various materials available. Tight construction to prevent excessive leakage of air is essential to effective insulation. Whenever barn walls are tightly built to save heat, ventilation becomes necessary. Storm sash, storm doors, vestibules, and feed rooms may be used as effective forms of protection against cold.

It is possible to maintain a comfortable temperature in a well-built barn and yet have an appreciable circulation of air. The temperature in a stable filled with stock can be controlled by temporarily or partly closing the ventilation system. Stable temperatures within certain limits appear to affect both the quantity and quality of milk. Wind velocity and direction have an effect upon the amount of ventilation. Back drafting may be due to poor design or poor position of ventilator or intake. Outtakes near the floor are more favorable to the maintenance of desirable stable temperature than ceiling openings. Under average conditions outside temperature is usually the dominant factor in barn ventilation. The moisture content of the air in a well-built stable is usually controlled by the amount of ventilation.

Horizontal runs and abrupt turns in outtake flues should be avoided. An air-tight flue with proper insulation is necessary to greatest efficiency. Lack of insulation may cause excessive drip from flues. This factor should be given consideration especially in the northern zone. The bases of ventilator heads should be equipped with suitable doors, which may be opened or closed as required. The efficiency of an outtake flue is affected by an open base. Windows as intakes require frequent adjustment and prevent uniform regulation of the ventilation. Their use for such purpose is undesirable in cold sections. However, during mild weather they are an advantage as they provide a large area of opening. Warm air furnace registers are unsuitable for use as intake valves in barn ventilation. Open hay chutes interfere with ventilation and should not be used as foul air shafts.

A formula is developed from which flue sizes proportioned to local temperatures may be obtained. In this formula $A=\frac{163+1.6\,t_0}{\sqrt{H}}$. A is the flue area for any outside temperature t_0 and H is the flue height.

A list of 47 references to literature bearing on the subject is included.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Missouri Station, 1928–29] (*Missouri Sta. Bul. 285 (1930), pp. 28–35, fig. 1*).—Investigations not previously noted are reported on as follows:

A table prepared by B. H. Frame is given showing per family and per person the total cash expenses, the total farm contributions, and the total living expenses by years from 1923 to 1927, inclusive. The data were obtained from 11 to 18 farm families each year.

Tables prepared by O. R. Johnson and Frame show the average number of man and horse hours per acre required for different operations on 3,733 acres of corn, 1912–1921, and on 2,732 acres of wheat, 1912–1922.

Tables prepared by Johnson show the average costs per acre, 1910–1927, by items of raising different crops and the average costs by items for different periods, 1912–1927, for different kinds of livestock and hens.

A continuation by Johnson and Frame of the study of labor requirement of farm poultry flocks previously noted (E. S. R., 52, p. 492) includes a curve plotted for 132 farm flocks showing the relation of hours of man labor per hen to the number of hens in the flock. This gave a parabola with an apex (lowest cost) at approximately 575 hens.

A study of taxation in Boone County by Johnson and E. E. McLean shows that from 1923 to 1928 the total assessed value of farm lands decreased 4.7 million dollars and that of city property increased 1.8 million dollars. Real estate now pays 87 per cent of the total taxes of the county. In 1923–1928 farms of over 140 acres were assessed at 80 per cent of their sale value and those under 140 acres at 65 per cent, as compared with 21 and 18.5 per cent, respectively, in 1910–1914. City property valued at over $10,000 and that under $10,000 were assessed at 47.5 and 53.5 per cent, respectively, in 1923–1928 and 21 and 26.5 per cent, respectively, in 1910–1914. In 1923–1928 17 per cent of the farms and 6 per cent of city lots were assessed at more than their sale values.

Tables prepared by Johnson are included showing by years from 1915 to 1928, inclusive, for the seven districts of the State and the entire State the index numbers of sale prices, value per acre, and real estate sales activity of farm land in Missouri.

The principles of co-operation (*Union So. Africa Dept. Agr. Bul. 80 (1930), pp. 40*).—Articles on agricultural cooperation in the Union of South Africa are included as follows: Principles of Co-operation, by A. P. van der Post (pp.

5–9), setting forth the principles of cooperation and reasons for its failure; Agricultural Co-operation, by N. Van Dalsen (pp. 10–14), explaining the provisions and operation of the Cooperative Societies Act, No. 28 of 1922; Ensuring Success in Co-operation, by W. Rode (pp. 15–20), giving a survey of points of importance in the formation of cooperative associations; Co-operative Methods, by E. R. Jacklin (pp. 21–28), discussing the economic justification of cooperation and methods applied in the management of such societies; The Business Side of Co-operation, by E. R. Jacklin (pp. 29–32), discussing some points not included in the article above; and Maize Co-operative Societies, by E. R. Jacklin (pp. 33–40), describing the position and problems of the old-established maize cooperative societies.

Wheat, W. W. Swanson and P. C. Armstrong (*New York: Macmillan Co., 1930, pp. XIII+320, pls. 3*).—This volume deals with the growing, harvesting, and marketing of wheat in the Provinces of Manitoba, Saskatchewan, and Alberta, together with chapters on the world wheat situation, wheat milling in Canada, exports to Great Britain, transportation and the wheat grower, the Government and the wheat grower, and the future of wheat growing.

Survey of the wheat situation, December, 1929, to April, 1930, M. K. Bennett et al. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 6 (1930), No. 6, pp. [1]+289–336, figs. 6*).—This is a continuation of the series previously noted (E. S. R., 62, p. 888). The changes in apparent grain supplies of 1929–30, international trade and import requirements, visible supplies and other stocks, wheat price movements, prospects for 1930 crops, and the outlook for trade, carryovers, and prices are discussed.

Agricultural regions of North America.—Part VIII, The Pacific subtropical crops region, O. E. Baker (*Econ. Geogr., 6 (1930), Nos. 2, pp. 166–190, figs. 15; 3, pp. 278–308, figs. 23*).—This is the eighth article in the series previously noted (E. S. R., 61, p. 288).

Agriculture in Rumania during the war, G. Ionesco-Sisesti (*L'Agriculture de la Roumanie pendant la Guerre. Paris: Presses Univ. de France; New Haven, Conn.: Yale Univ. Press, 1929, pp. XII+135, pl. 1*).—The chapters of this publication of the Carnegie Foundation for International Peace deal with the status of agriculture in Rumania prior to 1914, from the beginning of the war to Rumania's entrance in 1916, and in the provinces occupied by the German army; the mobilization of agriculture in the unoccupied provinces; and the effects of the war on the country's agriculture and its status since the war.

Land utilization in Japan, S. Nasu (*Tokyo: Inst. Pacific Relat., 1929, pp. [6]+5+262+6, pls. 5, figs. 27*).—This is a preliminary report prepared for the Research Committee of the Japanese Council, Institute of Pacific Relations, for use in connection with the third session of the institute.

Ohio farm land acquired by life insurance companies thru foreclosure in 1929, F. L. Morison (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 26 (1930) pp. 11, figs. 3*).—This bulletin presents data regarding mortgages held and farms owned by life insurance companies on January 1, 1930, and farm loans, foreclosures, sales made, and farms operated by such companies in 1929, with comparable data for the two preceding years.

Agricultural credit in different countries: History and legislation, G. Acerbo (*Storia ed Ordinamento del Credito Agrario nei Diversi Paesi. Piacenza: Fed. Ital. Consorzi Agrari, 1929, pp. 635+XIV*).—The development and present status of agricultural credit in general, in Italy and its colonies, and in other countries are described and discussed. Each chapter is followed by a bibliography.

Rural finance in New Zealand: The intermediate credit system and long-term advances, J. J. Esson (*New Zeal. Jour. Agr., 40 (1930), No. 6, pp.*

395–403).—This is a description of the State provisions for long-term advances and intermediate credit and the methods by which such loans are made.

Economic adjustments on farms in southeastern South Dakota, R. H. Rogers (*South Dakota Sta. Bul. 249* (*1930*), *pp. 47, figs. 9*).—The results reported of a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., by the route method, of the 1928 business of 16 representative farms in Lincoln, Clay, and Union Counties, and suggested farming systems are outlined for farms of different sizes with different percentages of tillable land. Tables are given showing the receipts, expenses, earnings, distribution of receipts and charges for the several farms, and the estimated receipts and expenses, by items, under the suggested farming systems.

An economic study of tractors on New York farms, C. W. Gilbert (*New York Cornell Sta. Bul. 506* (*1930*), *pp. 80, figs. 3*).—The data upon which this bulletin is based were collected in the fall of 1926 and the summer of 1927 by personal visits to 50 general hay and grain farms in Cayuga County, 42 fruit farms in Monroe and Orleans Counties, 20 dairy farms with cash crops in Chemung County, and 22 dairy farms with, and 41 without, cash crops in Chenango County. Tables are included showing the sizes and makes of tractors; number and width of tractor plows; and costs of operation, by items, for all work, drawbar work, and belt work, and the kinds of work done for the different types of farms studied. The costs of tractor operation, due to depreciation, repairs, new parts and expert labor, interest, repairing and other work done by farm labor, lubrication, use of buildings, insurance, automobile use, fuel, and tractor operator, are analyzed. The factors affecting the several costs, relation of use of tractor to man and horse labor and to farm organization, relation of size of tractor to cost of operation and to changes in farm area, labor, and equipment, and of size of farm to tractor use and to size of tractor are discussed. The advantages and disadvantages of the use of tractors are summarized.

The average annual cost of tractor operation in 1926 on the 175 farms was $268.63, exclusive of the cost for the operator, and $364.39 with the cost of the operator included. The average costs per hour of work done were as follows: All work, exclusive of cost of operator, 85.7 cts., cost of operator 30.5 cts.; drawbar work, cost without operator 86.9 cts. and cost of operator 38.4 cts.; and belt work, cost without operator 81.7 cts. and cost of operator 4.1 cts. Of the costs of operation for all work, 26.7 per cent was depreciation, 26.3 cost of operator, 24.2 fuel, 7.1 interest, 7 lubricants, 4.4 repairs, new parts, and expert labor, 3.1 work done by farm labor, and 1.2 per cent for use of buildings and automobiles and insurance. The average number of hours of work done was 313.1, of which 241.8 was drawbar work and 71.4 belt work. An average of 71 hours was done at custom work. An average per farm of 1.5 horses and 3.3 months of hired labor was displaced by tractors. At heavy work, tractors did the work of from 6.7 to 12.2 horses, and at light work that of from 2 to 4 horses. The estimated total useful life of the tractors studied was 8.5 years.

The form used in securing the data is included.

The St. Lawrence navigation and power project, L. R. Thomson (*Jour. Polit. Econ.*, *38* (*1930*), *No. 1, pp. 86–107*).—This is a review, analysis, and criticism of parts of the volume previously noted (E. S. R., 62, p. 280).

The St. Lawrence navigation and power project: A reply, H. G. Moulton, C. S. Morgan, and A. L. Lee (*Jour. Polit. Econ.*, *38* (*1930*), *No. 3, pp. 345–353*).—This is a reply to the article noted above.

The elements of marketing, P. D. Converse (*New York: Prentice-Hall, 1930, pp. XIX+1080, figs. 34*).—This volume is intended to replace the volume previously noted (E. S. R., 46, p. 594). Part 1 discusses the functions of marketing, including buying, selling, transportation, storage, standardization, and grading. Part 2 deals with marketing industrial goods and different farm products and marketing service. Part 3 describes and discusses the different methods of marketing, the different types of middlemen, and marketing organizations. Part 4 deals with marketing problems and policies such as fair competition, expenses and profits, purchasing and stock turnover, price-determining factors and price policies, market research, methods of distribution, selling and advertising, and coordination of business policies. Methods of reducing marketing costs are also discussed.

Each chapter is followed by a list of references, a bibliography, and questions.

Empire Marketing Board, May, 1929, to May, 1930 ([*Gt. Brit.*], *Empire Marketing Bd.* [*Pub.*] *28* (*1930*), *pp. 99*).—Included are reports on the progress in Empire marketing, the grants made for research and development, the economic investigation and marketing inquiries made by the board or on grants made by it, and the publicity given its work. Appendixes include lists of the personnel of the board and its committees, of its publications, and of the reports of the Imperial Economic Committee.

Reports by members of grain futures exchanges, I, II (*U. S. Senate, 70. Cong., 2. Sess., Doc. 264* (*1929*), *pp. VIII+68, figs. 9; 71. Cong., 2. Sess., Doc. 123* (*1930*), *pp. XI+347, figs. 30*).—This is the report of the Secretary of Agriculture transmitted in response to Senate Resolution 40, adopted February 21, 1928, directing the investigation of (1) the effect upon grain producers of the suspension by the Secretary of Agriculture of the requirement for the making of reports by members of grain futures exchanges, and (2) the situation of the 1927 May futures on the grain futures exchanges during the life of such future to determine the cause of the wide fluctuations in the price of wheat during the early months of 1927, especially after the suspension of the requirement of reports, including the reasons for and the effects of such suspension, the amounts of wheat purchased and sold on 1927 May futures contracts and the quantities actually delivered and received on such contracts, and the names of the parties doing heavy trading in the 1927 May futures.

Part 1 discusses the reasons for the suspension of the requirements, the effects of the suspension on the volume of trading in grain futures in wheat on the Chicago, Minneapolis, Kansas City, and Duluth markets, of corn on the Chicago and Kansas City markets, and on open wheat and corn commitments on the Chicago market; the trading in 1927 May futures and deliveries of wheat on such futures; and other information called for in the Senate resolution. Part 2 discusses the data obtained regarding the importance of different classes of traders, the relationship of open short commitments and the visible supply of wheat and corn, the market position of different classes of traders in relation to price movements of wheat and corn in the different markets, the influence of trading upon prices, and the geographic distribution of the trading and the commitments in Chicago futures.

The principal facts disclosed were as follows: Six of the seven largest speculators were in the market before the suspension. The reporting group in the 500,000 bushel-and-over class of speculators was principally short. The lowest prices for wheat were reached six weeks after the suspension, after which they reacted to changed crop conditions and then declined to record low. Large speculators were sometimes long and sometimes short. More of them were active in corn than in wheat, and their largest operations were confined to the Chicago market. Speculative activity accompanied both advances and declines in corn prices. Only one speculator in the 500,000 bushel-and-over group traded in Minneapolis or Kansas City futures. Of the 200,000 bushel-and-over group of traders in Chicago futures, 44 per cent of those in wheat and 32 per cent of those in corn were located in Chicago. Short commitments of hedgers were closely related to visible supply. The largest share of both trading and open commitments was for the accounts of small traders. The largest number of speculators in the 500,000 bushel-and-over group in the Chicago wheat market at any one time during the suspension period was 39. Prices of futures moved in the same direction as the net traders for the 500,000 bushel-and-over group 83 per cent of the time in the case of wheat and 72 per cent in the case of corn. Individual speculators built up net positions in excess of 5,000,000 bu. as follows: Wheat short on six occasions, long on two occasions, corn long on five occasions.

A survey of milk marketing in Derbyshire, June, 1928, F. J. Prewett (*Oxford: Clarendon Press; New York: Oxford Univ. Press, Humphrey Milford, 1930, pp. 70, pl. 1, figs. 10*).—This is a statistical report on the milk marketing organization of Derbyshire, a county typical of much of England.

The marketing of poultry and poultry products, C. H. Spamer (*Union So. Africa Dept. Agr. Bul. 59 (1930), pp. 80, figs. 35*).—The present methods of marketing, transportation, marketing costs, cooperative marketing, and standardization in and the foreign trade of South Africa are discussed.

Cooperative live stock: Field service manual (*Chicago: Natl. Live Stock Prod. Assoc., 1929, pp. 184, figs. 48*).—This is a manual giving information regarding the National Live Stock Producers Association, cooperative marketing in general and of livestock, livestock marketing, business records of cooperative livestock shipping associations, and general information regarding Federal and other legislation, bureaus, commissions, boards, etc.

Produce receipts by truck on the Columbus wholesale market, July 2–December 31, 1928, C. W. Hauck (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 16 (1929), pp. [2]+36, fig. 1*).—Tables are given showing the car lot arrivals; truck load receipts, by months and county of source; truck receipts by weeks; and the truck receipts, by months and county of source, for different kinds of produce.

Farm produce received in trucks on the Columbus wholesale market, 1929, C. W. Hauck (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 25 (1930), pp. 82, figs. 4*).—This is a continuation of the series noted above.

Crops and Markets, [August, 1930] (*U. S. Dept. Agr., Crops and Markets, 7 (1930), No. 8, pp. 273–320, figs. 3*).—Tables, reports, summaries, etc., of the usual type are included, together with the cotton report as of August 1; lamb crop report, 1930; poultry and egg outlook, July, 1930; sheep and wool outlook, August, 1930; and a table showing, by States, the refrigerated space reported to the Bureau of Agricultural Economics, October 1, 1929.

Trend of wholesale prices of farm products, foods, and other commodities, 1920 to 1930 (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 30 (1930), No. 6, pp. 255, 256, fig. 1*).—A table and a chart are given showing by months, January, 1920, to April, 1930, inclusive, the index numbers (1926=100) of wholesale prices of farm products, foods, and other commodities.

Statistics of meat production, consumption, and foreign trade of the United States, 1900–1929 (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. 10*).—This mimeographed preliminary report includes tables showing, by years 1900–1929, the total number and number of federally inspected cattle, calves, sheep and lambs, and swine slaughtered; and the estimated dressed weight (total and federally inspected), exports, net imports, and consumption (total and per capita) of all meats, beef, veal, lamb and mutton, pork, and lard.

Agricultural statistics, 1928 and 1929, H. L. French (*[Gt. Brit.] Min. Agr. and Fisheries, Agr. Statis., 63 (1928), No. 2, pp. 79–142; 64 (1929), No. 1, pp. 77*).—A continuation of the series previously noted (E. S. R., 62, p. 487).

Index numbers elucidated, W. I. King (*New York and London: Longmans, Green & Co., 1930, pp. XX+226, figs. 2*).—This book is intended for the use of college undergraduates and others with limited mathematical training, and has for its purposes "to show in extremely simple form what index numbers mean, how they are to be interpreted, how they differ from one another, when each of the most common types is to be used, and how each such type is to be constructed . . . ; to explode a number of fallacies which have gained wide acceptance; [and] to present the results of experiments in this field made with concrete data."

The cost of living in the United States, 1914–1929 (*New York: Natl. Indus. Conf. Bd., Inc., 1930, pp. XVI+190, figs. 9*).—Measurements of the cost of living, the method used by the National Industrial Conference Board in computing its cost of living index, the changes in the cost of living, 1914 through 1929, and studies other than those of the National Industrial Conference Board illustrative of various types of measurement are described and discussed.

The standard of living of farm families, Mr. and Mrs. R. C. Hill and E. L. Morgan (*Missouri Sta. Bul. 285 (1930), pp. 100, 101*).—A study of 70 farm families in the Ashland, Mo., community made to discover the relationship among the factors of labor income, household affairs, and social contacts showed among other things the following:

A large proportion of the people who had always lived in the community had a large number of social contacts. Social contacts per family decreased with an increase in age of farm operators. The larger families tended to have a greater amount of family recreation and more social contacts per person. Little or no relationship was found between social contacts and recreation and newspapers and magazines read, between quality of diet consumed and size of family, between education and social contacts, between health and quality of diet, between health and size of family, between clothing expenditures and money available for saving and living, and between food expenditures and clothing expenditures. Slight relationship existed between large farm capitalization, especially in the upper range, and large family recreation, between social contacts and money available for saving and living, between labor income and quality of diet, and between amount of money available for saving and living and the number of household conveniences. There was a definite or pronounced relationship between amount of money available for saving and living and the number of newspapers and magazines read, between quality of diet and money available for saving and living, between largest amounts of money available for saving and living and families having the highest education, and between condition of health and social activities. Families with a small number of social contacts spent relatively little for clothing. Families with few household conveniences had comparatively more social contacts than those with more such conveniences. Families of the older group of operators consumed a larger proportion of high quality diets, those of the middle age group a higher proportion of C and B grade diets, and those of younger operators about equal proportions of A, B, and C grade diets. There was a tendency for families with high social contacts to consume poor diets, those with a medium number of contacts good diets, and those with a small number fair diets.

The migration to towns and cities, V, VI, C. C. Zimmerman et al. (*Amer. Jour. Sociol., 36 (1930), No. 1, pp. 41–51; Social Forces, 8 (1930), No. 3, pp. 402–408*).—These are the fifth and sixth papers of the series previously noted (E. S. R., 60, p. 684).

No. 5, by Zimmerman and L. Smith, tests the hypothesis of chance selection in migration to cities from agriculture, and is based upon data concerning the economic and educational conditions among 252 city and 225 farm families in

Minnesota and the migrations of 236 children from the city families and 165 from the farm families. Some of the findings of the study were as follows:

(1) Farm families hold their children longer than urban families. (2) All classes sending children to, or keeping them in, agriculture give them less formal education than is given children sent to the cities, even to the lower urban classes. (3) Formal education may not be used as a measure of the quality of the population in testing selectivity. (4) No evidence of a net selectivity unfavorable to agriculture appeared, but there were some suggestions of assortative mating. (5) Farmers contribute primarily to the middle class in cities and slightly more to the lower than to the upper class. (6) The most important element in the urban upper class was the children of farmers, followed by the children of the upper classes themselves, and then the children of the lower classes. (7) Occupations other than agriculture are composed out of the most heterogeneous groups. (8) First-born children of agricultural families show a preference for agriculture, indicating that the organization of the family is a factor in rural-urban selectivity.

No. 6, by Zimmerman and J. J. Corson, 3d, analyzes the data obtained by Gee and Corson (E. S. R., 62, p. 185) and by Gee and Stauffer (E. S. R., 62, p. 581) and discusses the significance of the finding regarding order of birth as a factor in rural-urban selectivity.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural education, C. H. LANE (*Fed. Bd. Vocat. Ed. Bul. 13, rev. ed. (1930), pp. VII+63*).—This revision (E. S. R., 53, p. 298) brings the information regarding the administrative policies of the Federal board and the organization and administration of State programs in the field of agricultural education up to date. The texts of the memorandum approved December 20, 1928, by the Secretary of Agriculture and the chairman of the Federal Board for Vocational Education regarding the respective fields of agricultural extension and vocational educational work and the relationship between the workers in the two fields, and of the George-Reed Act providing for the further development of vocational education are included.

The high school education of farm boys and girls in South Dakota, W. F. KUMLIEN (*South Dakota Sta. Bul. 250 (1930), pp. 62, figs. 23*).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A. The data were obtained by visits to 31 high schools; the use of 5 questionnaire schedules; interviews with parents of pupils, teachers, school executives and officers, and county and State school officials; and the statistical analysis of census materials and public records.

The high school situation of the State as a whole and its rural relationships are described, and the situation in Brookings County, a county fairly typical of the eastern part of the State, is discussed more fully, including elementary school organization, high school population and enrollment (actual and potential), choice of high school, transportation and living problems, family and community relationships of high school pupils, education of parents, high school service and its relation to other community services, courses of study, finances, buildings and equipment, and vocational training.

Methods of teaching as applied to vocational education in agriculture, A. P. WILLIAMS (*Fed. Bd. Vocat. Ed. Bul. 103, rev. (1930), pp. VII+74, figs. 7*).—This revision (E. S. R., 53, p. 396) includes considerable new material and deals primarily with the group instruction phases of teaching. It makes specific suggestions for teaching; gives examples of teaching and teaching material, including lesson plans, job analyses, and related science; describes in detail the instructing process, teaching functions, levels of learning, and teaching procedure; describes and classifies methods and devices in reference to their use in the instructing process; and defines the terms used and the conceptions underlying the relation of methods to content of teaching.

Analysis of the management of a farm business, C. H. Schopmeyer (*Fed. Bd. Vocat. Ed. Bul. 88, rev. (1930), pp. VII+27*).—This is a revision of a bulletin previously noted (E. S. R., 50, p. 394).

Analysis of the management of a corn-growing enterprise, C. H. Schopmeyer and A. P. Williams (*Fed. Bd. Vocat. Ed. Bul. 101, rev. (1930), pp. VII+20*).—This is a revision of a bulletin previously noted (E. S. R., 53, p. 495).

Analysis of the management of a cotton-growing enterprise, C. H. Schopmeyer and A. P. Williams (*Fed. Bd. Vocat. Ed. Bul. 105, rev. (1930), pp. VII+24*).—This is a revision of a bulletin previously noted (E. S. R., 55, p. 284).

A work-book for students in fruit-growing, W. A. Broyles (*New York and London: Century Co., 1930, pp. X+209, figs. 73*).—This work book, for use in the vocational teaching of fruit growing, is divided into 16 sections, 15 of which are devoted to the major questions every fruit grower must answer for himself. Eighty-one jobs, projects, or "contracts" are included, a list of things for the student to do, a series of questions, a list of things for the student to think about, and a list of references being given under each.

FOODS—HUMAN NUTRITION

Report of the Medical Research Council for the year 1927–1928, Earl of Balfour et al. (*[Gt. Brit.] Med. Research Council Rpt. 1927–28, pp. 165*).—This annual report (E. S. R., 59, p. 288) contains the customary progress reports of research schemes in specific subjects, among which are many studies in human nutrition which have been noted from completed reports.

Report of the Medical Research Council for the year 1928–1929, Viscount D'Abernon et al. (*[Gt. Brit.] Med. Research Council Rpt. 1928–29, pp. 153, pls. 2*).—In addition to the usual progress reports as noted above, this report contains a general review of the progress made in the work of the council during the preceding five-year period.

The thirty-fourth report on food products and the twenty-second report on drug products, 1929, E. M. Bailey (*Connecticut State Sta. Bul. 319 (1930), pp. 773–823*).—In this annual report of the routine analyses of foods and drugs (E. S. R., 61, p. 890), proximate analyses of 86 cereal products have been incorporated in a table, with earlier analyses reported in Bulletins 197 (E. S. R., 38, p. 663) and 286 (E. S. R., 57, p. 591).

Methods of roasting beef, J. A. Cline, S. Cover, and B. K. Whipple (*Missouri Sta. Bul. 285 (1930), pp. 81–83*).—This progress report (E. S. R., 58, p. 492) summarizes results obtained in an application of the constant low temperature methods of cooking prime rib roast (a tender cut) to the tougher chuck cuts, including the third, fourth, and fifth ribs. Three constant temperatures were tested—325, 375, and 425° F. Two searing methods were also used. In one the roast was seared for 20 minutes in an oven at 530° and the roast finished in an oven at 260°. In the other the roast was put into a cold oven and the regulator set at 450° for 30 minutes and then reduced to 300° to finish cooking. Two muscles of the cut were tested, one the infraspinatus, located above the shoulder blade, and the other, the serratus cervicis, located under the shoulder blade. The first muscle was tested in all of the roasts and the second only in the roasts cooked at a constant temperature of 325°. Cooking data were recorded for 11 roasts cooked by the lowest constant temperature method at a temperature of 325° and for 9 roasts by each of the other methods.

It is stated that although the data were too meager to allow definite conclusions to be drawn, the following tendencies were noted: The lowest constant temperature methods gave the least average total loss, but required the longest average time per pound. The infraspinatus muscle was reasonably satisfactory in all of the methods, with no great advantage of one over another. The serratus cervicis muscle became tender enough to be palatable when cooked at the lowest constant temperature. In general the two methods which appeared to be most desirable were the lowest constant temperature and the method starting with the cold oven. A comparison of the palatability data of chuck and rib for the lowest constant temperature method showed the first chuck muscle to be more tender and the second chuck muscle tougher than the eye of prime beef.

Biological value of the proteins of barley, rice, kaoliang, and millet, T. W. Li (*Chinese Jour. Physiol., 4 (1930), No. 1, pp. 49–58*).—The biological values of the proteins of several cereals common in North China were determined by the method of Mitchell (E. S. R., 51, p. 407). At a 10 per cent intake level the values were rice 77, barley 64, millet 57, and kaoliang 56 in comparison with a value of 52 for white flour as reported by Mitchell.

Dietary properties of the flat bean (Dolichos lablab L.), T. T. Chen (*Chinese Jour. Physiol., 4 (1930), No. 1, pp. 73–77, fig. 1*).—The white variety of the Chinese flat bean, *D. lablab*, used in China in cakes or sweets at feasts, did not promote growth in rats when fed at a level of from 55 to 60 per cent of the ration unless supplemented by additions of protein, minerals, vitamin A, and the vitamin B complex.

Birth weight and growth of Chinese infants during the first year, E. Tso (*Chinese Jour. Physiol., 4 (1930), No. 1, pp. 31–40, figs. 5*).—A statistical study is reported of the birth weight and height data for a large number of Chinese infants born in the Peiping Union Medical College Hospital, Peiping (Peking), China, and of the growth during the first 10 months of life of Chinese babies attending the pediatric clinic of the same hospital. The average birth weight of the boys was 3,117±16 gm. (about 6 lbs. 14 oz.) and of the girls 2,980±16.3 gm. These figures are distinctly lower than American or European standards. The average standing height at birth was 49.9±1 cm. (about 20 in.) for the boys and 48.8±1 cm. for the girls, these figures being comparable with those of occidental races. The average growth curves for both sexes followed quite closely the British standard values established by T. B. Robertson.

The composition of normal rat blood, A. K. Anderson, H. E. Honeywell, A. C. Santy, and S. Pedersen (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 157–160*).—In this contribution from the Pennsylvania Experiment Station, data are reported on the composition of the blood of 28 normal rats and 3 rats with bad lungs. In one group of 20 rats, sugar, nonprotein nitrogen, creatinine, and creatine plus creatinine were determined, and in the remaining 11 urea nitrogen, uric acid, and sodium chloride. The animals varied in age from 3 to 16 months, and included male and female and albino and pied rats.

The tabulated data show that in most respects rat blood is quite similar in composition to human blood. The average nonprotein nitrogen was considerably above that of human blood, and the blood sugar, urea nitrogen, and chloride values slightly higher. There was very little difference between the composition of the blood of males and females in the same age groups and between that of albino and pied rats. In the 3 rats which were found on autopsy to have badly infected lungs, the average blood sugar value was over twice that for normal animals and the nonprotein nitrogen values definitely higher.

Resistance of omnivorous and vegetarian rats against bacterial infections, T. T. Chen and C. P. Li (*Chinese Jour. Physiol., 4 (1930), No. 1, pp. 59–64*).—An extension of the studies of Wu and Chen (E. S. R., 62, p. 91) on the effects of strictly vegetarian diets on rats has shown that the vegetarian rats are less resistant to infection than the omniverous rats, at least against the hog cholera bacillus. The decrease in resistance of these rats is thought to be due to lowered vitality associated with the smaller stature.

The significance to clinical medicine of studies in calcium and phosphorus metabolism, D. Hunter (*Lancet [London], 1930, I, Nos. 17, pp. 897–904, figs. 3; 18, pp. 947–957, pls. 2, figs. 3; 19, pp. 999–1008, figs. 4*).—This is a series of three lectures delivered before the Royal College of Physicians of London in March, 1930. The first consists of a brief review of the normal mechanism of calcium and phosphorus metabolism and a discussion of the action of parathyroid hormone. The second, which is illustrated by colored plates, deals with the sources of available calcium in the bones and the differences between the effects upon bone structure of hyperparathyroidism and hyperthyroidism. In both of these conditions calcium is considered to be removed from the bones, but in hyperthyroidism there is no increase in the calcium content of the blood, while in hyperparathyroidism there is an increase. The final lecture deals with conditions associated with defective absorption and utilization of calcium and phosphorus, particularly early and late rickets and osteomalacia, with the pathological storage of lead in the bones in chronic lead poisoning, and with the use of calcium salts in the treatment of various disorders.

The lectures contain not only a critical review of the literature, but many illustrations from the clinical experience of the author and of H. M. Turnbull. Lists of literature references assembled at the end of each of the three lectures constitute a bibliography of 162 titles.

Five years' clinical experience with lemon juice-milk, L. H. Barenberg, H. Abramson, and W. H. Messer (*Amer. Jour. Diseases Children, 39 (1930), No. 5, pp. 948–953*).—In an institution in which lemon juice milk, prepared as described by Hess and Matzner (E. S. R., 51, p. 867), was first introduced over five years ago, the preparation has since been used regularly in the routine feeding of 145 infants varying in age from six weeks to one year or more. Analyses of the records of these infants showed in general a better rate of growth than in those receiving other milk preparations, particularly in the group under three months of age.

A special study of the effect of lemon juice milk on the stools of infants during the period from January to May, a time when respiratory infections frequently associated with intestinal disturbances were most frequent, showed fewer cases of diarrhea and these of a milder type in infants receiving the lemon juice milk than in the control group. In a similar comparison of a group of older children receiving 3 per cent of lemon juice in their milk in addition to the regular diet with a control group receiving no addition, the number of infections was greater, but the number of instances of diarrhea much less.

[Vitamin studies on Missouri Jonathan apples], M. C. Hessler, R. E. Anderson, and E. Eisenbarth (*Missouri Sta. Bul. 285 (1930), p. 84*).—In this progress report (E. S. R., 62, p. 95), it is stated that with the technic of Sherman, LaMer, and Campbell the minimum protective antiscorbutic dose of raw Jonathan apples tested from September to November was 25 gm. and for stored apples tested from December to May 40 gm. Apple sauce canned in June from Red June apples afforded no protection in vitamin A tests by the Sherman-Munsell method. It is stated that 4.5 gm. of apple pulp tested in February and March contained 1 unit of vitamin A.

The vitamin A content of ghee, A. L. BACHARACH (*Brit. Med. Jour., No. 3629 (1930) pp. 141, 142*).—The author reports briefly that of four samples of ghee sent from India to England in ground glass-stoppered jars or sealed tins, two showed no trace of blue color when the chloroform solution of the unsaponifiable fraction of the material was subjected to the antimony trichloride color test. A third sample showed a trace of color and a fourth an amount corresponding to $^1/_{500}$ that of good cod-liver oil or about $\frac{1}{10}$ that of average butter. This sample was then fed in 1-gm. daily doses to a single rat whose stores of vitamin A had been depleted. After a temporary slight increase in growth, the animal rapidly lost weight and developed marked xerophthalmia. while others in the same litter fed 5 mg. daily of an active cod-liver oil responded with normal growth.

Although this test was conducted on only one animal, the results, together with the color tests, are thought sufficiently conclusive to indicate that the ghee was practically devoid of vitamin A.

Attention is called to an earlier report by Ghose (E. S. R., 47, p. 661) before the differentiation of vitamins A and D, in which the conclusion was drawn that ghee contains vitamin A.

Carotene and vitamin A: The anti-infective action of carotene, H. N. GREEN and E. MELLANBY (*Brit. Jour. Expt. Path., 11 (1930), No. 2, pp. 81–89, fig. 1*).—In this continuation of the authors' studies on the relation of vitamin A to protection against infection (E. S. R., 62, p. 294), carotin has been investigated as to its anti-infective properties by the customary feeding experiments with rats. The sample of crystalline carotin used, melting point 174° C. (in air), was dissolved in freshly distilled ether and the desired amount of the solution allowed to evaporate on casein, which was then mixed with a little of the basal diet and fed to the rats before any other food was given, the controls receiving an equivalent amount of extra casein.

Three series of experiments were run. In one there was no preliminary depletion period and the experiment lasted 119 days; in another the rats were kept for 32 days on the A-free diet before the supplement was given and the entire experiment lasted 125 days; and in the third the rats were kept for 52 days on the A-free diet and the total length of the experiment was 161 days.

As shown by the tabulated data, complete protection was always secured when amounts of over 0.04 mg. of the carotin were given daily, even when the prolonged depletion period on the A-free diet had preceded the addition of the carotin. In one animal on 0.04 mg. no recovery followed, but this was considered an exceptional result, as in other animals of the same series 0.02 mg. had been sufficient. Some of the animals receiving only 0.01 mg. were protected, while others died with various organs invaded by microorganisms. With 0.005 mg. there was still less protection, although there was evidence of increased resistance as compared with controls receiving no carotin. From these results it is estimated that a daily dose of 0.02 mg. is sufficient for complete protection against infection.

In discussing the significance of these findings, the authors point out that the protective dose of carotin against infection is higher than the amount required for stimulation of growth for a short period (roughly 0.02 and 0.005 mg., respectively). In regard to the identity of carotin with vitamin A, it is noted that the protective doses, although small, are still much larger than the protective dose of vitamin D and that this might suggest that the active agent is present in the carotin as an impurity. It is thought, however, that the balance of evidence is in favor of the view that carotin itself is the specific substance responsible for the vitamin A activity of green vegetables, carrots, and butter, and possibly of egg yolk. In regard to liver, which does not contain carotin as such, the possibility is suggested of the presence of "a highly active leuco form of carotinoid which may be reconverted to carotin and liberated into the circulation as required.

"If carotin has a similar function in man to that in the rat, as seems probable, it should prove valuable both as a prophylactic and therapeutic agent. As a therapeutic agent it should be of special importance for rapid and effective action, for it can be given without the large amount of lipoid material, often badly tolerated, which has to be given in the massive vitamin A therapy with liver-fat preparations."

The anti-infective power of carotene (*Lancet [London], 1930, I, No. 17, pp. 925, 926*).—This editorial comment on the contributions of Green and Mellanby, noted above, calls attention to their observation that with limited amounts of vitamin A there may be no outward signs of deficiency other than a heightened susceptibility of the mucous membrane to infection. "This observation has an obvious and probably very important bearing on the relation of vitamin A deficiency to mucous tract infection in human beings."

Some further notes on the relation of carotene to vitamin A, E. M. HUME and I. SMEDLEY-MACLEAN (*Lancet [London], 1930, I, No. 6, pp. 290–292, fig. 1*).—The suggestion previously made by the authors (E. S. R., 62, p. 206) and also by Moore (E. S. R., 62, p. 587) that the failure of Dulière, Morton, and Drummond to demonstrate vitamin A activity in carotin (E. S. R., 63, p. 8) was due to the exclusion of fat from the basal diet has been tested with results which failed to confirm this hypothesis but indicated that the solvent employed in order to avoid the use of a natural fat is responsible for the failure.

In the experiments reported there was no appreciable difference in the growth of rats receiving 0.006 mg. of carotin as the source of vitamin A whether the diet contained no fat or 16 parts of arachis oil in place of the same amount of starch. Corresponding groups of rats were then fed diets furnishing 0.003 mg. daily of carotin in hardened cottonseed oil and 0.005 mg. in ethyl oleate. On the former diet growth at a fair rate took place, but on the latter almost no growth. The rapid decolorization of the carotin in the ethyl oleate suggested its oxidation. The effects of various solvents in producing oxidation of carotin were then compared. The most rapid decolorization took place in a solution of carotin in oleic acid, followed by solution in ethyl oleate, while there was almost no loss of color in the paraffin or olive oil.

It was concluded that the presence or absence of fat from the basal diet does not appear to be a factor of any importance in determining the biological activity of carotin. "It can not yet be decided whether carotin acts as a provitamin, as Moore has suggested [E. S. R., 62, p. 492], or whether carotin from all sources is always accompanied by a constant percentage of impurity, which up to the present has defied all methods to separate it."

Vitamin A and streptococcal antitoxic immunity, A. H. G. BURTON and A. R. BALMAIN (*Lancet [London], 1930, I, No. 20, pp. 1063–1066*).—In order to put to further test the suggestions of Mellanby and Green (E. S. R., 62, p. 294) that vitamin A acts as an anti-infective agent to bacterial infection, the prophylactic effect of a concentrate of vitamin A (Radiostoleum) on antitoxic immunity, as demonstrated by the Dick test, was determined (a) in a group of pregnant women attending an antenatal clinic and (b) in patients suffering from scarlet fever. In 16 of the 52 pregnant women tested, the Dick reaction turned from positive to negative, but in 3 it again reverted to positive. In the 64 women with scarlet fever, the Dick reaction during convalescence showed no marked alteration from that in a control series of 107.

The case history of 1 patient with puerperal fever is reviewed, in which the administration of a vitamin A concentrate appeared to have a definitely favorable effect. The authors seem inclined, however, to attribute this to mere coincidence, and conclude that "there is no prophylactic value in administering vitamin A in pregnancy to prevent the development of puerperal fever; also that it is doubtful whether the effects which have been described as following its administration for the purpose of treatment are not a coincidence. The conclusions based on experimental evidence of other works have recorded that a deficiency of vitamin A in the diet predisposes to changes in the epithelial linings of mucous tracts in animals, and, therefore, allows infection to occur. This does not, in our opinion, justify a belief that the adequate supply of such vitamin would, in the presence of a sufficient ineffective dose and the absence of immunity, prevent the occurrence of infection."

Vitamin A and infections, W. Cramer (*Lancet [London], 1930, I, No. 21, pp. 1153, 1154*).—This note was occasioned by the paper of Burton and Balmain, noted above, the author concurring with the view expressed therein that vitamin A has no antiinfective effect in the sense indicated by Mellanby and Green (E. S. R., 62, p. 294). In his opinion, based upon his own researches (E. S. R., 53, p. 459), an adequate supply of vitamin A is a powerful physiological prophylactic against infections entering by the mucous membranes. "It may possibly be of therapeutic value also in the treatment of some chronic intestinal toxemias and of chronic infections of the respiratory and intestinal tracts, especially where these have been associated with defective nutrition. But that has yet to be demonstrated. There is no evidence, however, that vitamin A can cure infections once the barrier of the mucous membranes has been passed, or that it can prevent or cure those infections which enter by the blood stream or by the subcutaneous tissues, as they do, for instance, in puerperal septicemia. To call vitamin A an 'antiinfective' vitamin is as much a misnomer as to call it a 'growth promoting' vitamin. It seems unwise to exaggerate the extent of its real action and to make claims for it which can not be realized. Disappointment is sure to follow. This will discredit the more limited though really effective action of vitamin A of maintaining the physiological defenses of the mucous membranes, which are the portals of entry of most infections in man."

Vitamin G in certain meats and meat by-products, R. Hoagland and G. G. Snider (*Jour. Agr. Research [U. S.], 41 (1930), No. 3, pp. 205–220, figs. 10*).—Using essentially the same methods as in the previous study of the vitamin G content of beef extract (E. S. R., 63, p. 594), the authors, at the Bureau of Animal Industry, U. S. D. A., have determined the vitamin G content of three lots of beef (round steak) and one lot each of pork tenderloin, smoked ham, lamb (shoulder), beef liver, pork liver, beef kidney, and beef spleen. The meats and meat by-products in all cases were trimmed as free from fat and connective tissue as practicable, ground, and dried at approximately 60° C. in an oven with forced draft. The dried products were ground and those containing much fat thoroughly extracted with ether. Analyses for nitrogen were made of all products and for fat of those not extracted, and the necessary adjustments made in the basal ration.

Allowance being made for some variations in the vitamin content of different lots of the same kind of meat, beef, pork, and lamb muscle appeared to contain approximately the same quantities of vitamin G, from 15 to 25 per cent of the dried material being sufficient for excellent growth. Beef spleen was about as rich in vitamin G as the muscle meats, but beef and pork liver and beef kidney were from 5 to 8 times as rich in vitamin G as the muscle meats. "Three per cent of beef liver, 3.05 per cent of pork liver, and 2.77 per cent of beef kidney, respectively, furnished an ample supply of vitamin G for rapid growth in rats. The minimum quantity necessary for normal growth is probably considerably less than the proportions indicated."

The etiology of pellagra, W. R. Aykroyd (*Brit. Med. Jour., No. 3613* (*1930*), *pp. 647, 648*).—Taking exception to Wilson's note reaffirming the protein theory of pellagra (E. S. R., 63, p. 196), the author summarizes briefly recent evidence on the vitamin theory, particularly the studies of Aykroyd and Roscoe (E. S. R., 62, p. 194) showing the striking similarity in distribution in foodstuffs of vitamin B_2, Goldberger's P-P factor, and the factor preventing blacktongue in dogs. The principal argument in favor of the vitamin rather than protein deficiency theory of pellagra is thought to lie in the demonstration that the disease can be prevented and cured with nonprotein substances.

The rôle of the skin in the cure of rickets by irradiation, H. C. Hou and E. Tso (*Chinese Jour. Physiol., 4* (*1930*), *No. 1, pp. 93–116, pls. 2*).—Evidence is reported of a certain degree of antirachitic activity in the skin of normal rabbits, but not of rachitic rabbits or of rabbits kept in the dark and protected from rickets by the administration of vitamin D. The skin taken from the dorsal surface was of greater potency than that from the ventral surface. Esophageal epithelium was much less antirachitic than ordinary skin epithelium. Dog skin was also antirachitic and the ether-soluble nonsaponifiable fraction more potent than the skin itself. The test of a small amount of human sebaceous cyst material showed it to be moderately antirachitic. These studies, which were occasioned by the findings of Hou, previously noted (E. S. R., 61, p. 864) concerning the preen gland as the source of vitamin D in chicks, are thought to demonstrate that the natural source of vitamin D lies in the skin and probably in the sterol content of the sebaceous secretion.

Antirachitic value of winter sunlight in the latitude of 42° 21′ (Boston), E. T. Wyman, P. Drinker, and K. H. Mackenzie (*Amer. Jour. Diseases Children, 39* (*1930*), *No. 5, pp. 969–979, figs. 10*).—Fifteen infants suffering from acute rickets were exposed to winter sunlight in Boston in a solarium provided with Cel-O-Glass windows placed at an angle of 60°. Those exposed during the months of November, December, and January became deeply tanned, although not as quickly as those treated after March 1. In all of the cases X-ray evidence of calcium deposition was obtained after the second week, with calcification continuing to increase throughout the period of observation. In most of the cases there was a sustained rise in the product of calcium and phosphorus beginning with the second week. "Therefore, it seems justifiable to conclude that infants and children with rickets can be cured by sunshine in Boston (latitude 42° 21′) by exposing them during the months of November, December, January, February, and March to sunshine transmitted through Cel-O-Glass."

Antirachitic effect of winter sunshine through Celoglass: Results of experimentation on rats, T. S. Wilder and C. Vack (*Amer. Jour. Diseases Children, 39* (*1930*), *No. 5, pp. 930–934, figs. 2*).—Additional evidence of the antirachitic effect of winter sunlight transmitted through Cel-O-Glass in the latitude of Boston was obtained by the exposure of rats following the general plan of Tisdall and Brown (E. S. R., 58, p. 495), with slight differences in procedure. The rats were exposed throughout the day instead of for two hours at noon and were killed after six weeks instead of four.

The average content of bone ash and of inorganic phosphorus in the blood of rats exposed in the solarium was nearly twice that of the controls. While the controls showed marked rickets, all of the exposed animals were free from it except one group exposed from January 27 to February 23 which showed evidence of slight rickets, suggesting a lesser degree of protection during that month.

Comparative value of viosterol and cod liver oil as prophylactic antirachitic agents: A clinical study, A. G. De Sanctis and J. D. Craig (*Jour.

Amer. Med. Assoc., 94 (1930), No. 17, pp. 1285, 1286).—In this comparison 100 infants were given cod-liver oil in a dosage of 3 teaspoonfuls daily and 123 viosterol in a dosage of 10 drops daily for a period of at least 3 months, during which time clinical evidences of rickets were recorded. The cod-liver oil, which had a vitamin D activity of from 140 to 170 Steenbock rat units, prevented rickets in 97 per cent of the cases studied and the viosterol with a vitamin D activity of 300 Steenbock rat units in only 77 per cent of the cases studied.

"From the foregoing observations, one of two conclusions may be drawn: Either the present recommended prophylactic dose of viosterol is too small to prevent rickets, or rickets is not due to a deficiency of vitamin D alone. We are inclined to believe that the second of these possibilities is true."

Calcium and phosphorus metabolism in rats during pregnancy and lactation, and the influence of the reaction of the diet thereon, H. Goss and C. L. A. Schmidt (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 417–432, figs. 9*).—Calcium and phosphorus balance experiments were conducted on rats through continuous periods of rest, pregnancy, and lactation on natural food diets varying from alkaline to acid. Data for all the experiments are not reported, but typical results are shown graphically.

Out of 27 completed pregnancy periods, only 4 failed to show a positive balance of calcium and 3 of phosphorus. In most cases the balances were in excess of the amounts estimated to be contained in the young at birth. In all of the 17 lactation periods, on the contrary, there was a negative calcium balance and in all but 1 a loss of phosphorus. Within the range of reaction employed, the equivalent of 440 cc. of N/10 NaOH per 100 gm. and 206 N/10 HCl per 100 gm., no significant differences could be detected except that second litters of rats on the diet containing sodium bicarbonate were not nourished. No differences could be detected in the storage of calcium and phosphorus in the young of mothers maintained for some time on the acid and alkaline diets.

Females on a vitamin E-free diet stored calcium and phosphorus during the period of pregnancy in which the resorption of the fetus took place.

TEXTILES AND CLOTHING

The basic amino acids of wool, H. B. Vickery and **R. J. Block** (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 107–111*).—An analysis of thoroughly cleaned and sterilized wool at the Connecticut State Experiment Station showed that the keratin contained 0.66 per cent of histidine, 7.8 per cent of arginine, and 2.3 per cent of lysine. In the composition of these basic amino acids wool was closely comparable to human hair.

The chemical sectioning of plant fibres, M. A. el Kelaney and **G. O. Searle** (*Roy. Soc. [London], Proc., Ser. B, 106 (1930), No. B 745, pp. 357–363, pls. 2*).—A transverse lamellation with a tendency under certain conditions for fibers to segment into thin sections perfectly transverse to the longitudinal fiber axis is recorded as a phenomenon first described and illustrated by Searle (E. S. R., 52, p. 337). In a simple method outlined for obtaining thin transverse sections of plant fiber bundles, the fiber is boiled in sulfuric acid and without washing is dried in an oven until it commences to char. The tendered fiber is mounted in caustic soda solution and submitted to suitable pressure, whereupon the fiber bundles segment into transverse sections. These sections are usually between 10μ and 20μ thick, quite flat, exactly transverse, and retain all the fine details of structure present in the untreated fiber. Sections so prepared may be of value in the routine identification of different fibers.

Technological reports on standard Indian cottons, 1930, A. J. Turner (*Indian Cent. Cotton Com.* [*Bombay*], *Technol. Bul., Ser. A, No. 14* (*1930*), *pp. IV+122, figs. 23*).—The current edition is similar to the previous report (E. S. R., 61, p. 698) in scope and includes the results of tests on the standard Indian cottons of the 1929–30 season and summarized data on the seasons 1923 to 1930, inclusive. Jayawant, a new standard Kumpta cotton included, said to be highly resistant to wilt, was derived from a cross between pure lines of Dharwar cotton.

The durability of white and colored cotton fabrics as affected by home and commercial laundering, A. E. Ginter and E. Morris (*Missouri Sta. Bul. 285* (*1930*), *pp. 83, 84*).—Five white cotton fabrics were laundered 55 times by home and commercial methods and were subjected to textile tests after 5, 15, and 30 launderings.

The wear on the fabrics, as measured by decreased tensile strength after thirty launderings, was greater with the commercial methods of laundering than with the home method, and was greater with the commercial method used for badly soiled fabrics than for the method used for slightly soiled fabrics. The amounts of wear, as measured by tensile strength, with the two home methods of ironing differed little. It appeared that differences in the direction of the shrinkage may be expected with white cotton fabrics laundered by home and commercial methods, and that noticeable differences in shrinkage may be expected for such fabrics laundered by commercial methods used for the soiled fabrics. Indications were that the durability of fabrics can not be determined definitely by tests on unlaundered fabrics.

A study of women's coats, A. O. Halgrim (*South Dakota Sta. Bul. 248* (*1930*), *pp. 30, figs. 4*).—In an effort to determine what relationship exists between the quality of the fabric and the retail purchase price of women's coats, 66 coats were purchased at retail stores in different parts of the State. In each case a statement was obtained from the sales person as to the character of the fabric and note was made as to any guarantee for the coat. Some of the fabric from each coat, including the lining, was then subjected to the usual textile analyses and to durability tests, the latter including tensile strength for woven and bursting strength for knit fabrics, weathering, abrasion, waterproofing, fastness of color, and shrinkage.

According to the statements of the sales persons, all of the coats except one were all wool and for this the statement was made that it was more than half wool. This fabric proved, however, to be only a little over 7 per cent wool. Of the others, 6 contained more than 10 per cent cotton, 6 between 1 and 10 per cent, 10 a trace, and the others no cotton. No relationship between cost and amount of cotton is brought out beyond the fact that the average amount of cotton in the coats below the average price of $29.52 was 3.59 per cent, while for those above the average price the average amount of cotton was 3.32 per cent. In this as in most of the factors studied, the higher-priced garments tested better than the low-priced, but not at all in proportion to the increase in price. This was true not only of the fabric of the coat itself but of the lining. While the average quality of the linings of the higher-priced coats was higher, price alone did not determine the quality.

Minor details of garments which affect quality and might be expected to affect cost were also considered, including the method of sewing in the lining, the use and kind of stay tapes, the kind of buttonholes, and the materials used for stitching seams. One of the two most expensive coats examined, costing $69.50, had no stay tapes, the lining was sewed in by machine, and the seams were stitched with cotton.

HOME MANAGEMENT AND EQUIPMENT

The use of time by South Dakota farm homemakers, G. E. WASSON (*South Dakota Sta. Bul. 247* (*1930*), *pp. 29, figs. 13*).—This study, made in cooperation with the Bureau of Home Economics, U. S. D. A., is based on records for one week's work each of 100 rural home makers in 38 counties of the State. Of the records, 17 were for summer months, 14 for fall months, 22 for winter months, and 47 for spring months. Tables are given and discussed showing the number of families, by size, and the number of women spending different ranges of hours in different activities.

The average number of working hours for the entire group was 66 hours and 10 minutes per week, and the average distribution between different activities was as follows: Food preparation 25 hours and 55 minutes, care of house 10 hours and 28 minutes, care of clothing 11 hours and 57 minutes, care of family 3 hours and 43 minutes, management 1 hour and 40 minutes, sleep and rest 62 hours and 37 minutes, eating meals 9 hours and 8 minutes, care of self 4 hours and 47 minutes, leisure 23 hours and 40 minutes, farm work 11 hours and 33 minutes, other work 17 minutes, and miscellaneous 2 hours and 16 minutes.

MISCELLANEOUS

Experiment station research [at the Missouri Station, 1929], F. B. MUMFORD, S. B. SHIRKY, ET AL. (*Missouri Sta. Bul. 285* (*1930*), *pp. 116, figs. 25*).—This contains the organization list, a report on the work and publications of the station, and a financial statement for the Federal funds for the year ended June 30, 1929. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Fifty years of service to agriculture (*New Jersey State Sta., 1930, pp. 36, figs. 76*).—This is a brief history of the New Jersey State Agricultural Experiment Station from 1880 to 1930, prepared in connection with the Semi-Centennial Commemoration Exercises, October 8 and 9, 1930 (discussed editorially on page 701). The leading events are set forth in descriptive and chronological form, and much data incorporated as to the present organization and personnel, the commemorative tablets in honor of Drs. G. H. Cook and E. B. Voorhees, and some of the "high lights of achievement."

Classified list of available publications (*Vermont Sta. Circ. 14* (*1929*), *pp. 4*).—The station bulletins available for distribution are classified into 22 subject matter divisions.

NOTES

Arizona University and Station.—A new laboratory for research on dates is being erected on the Tempe farm. The Yuma Substation, located on the lower levels, has been sold and a larger area of much more uniform land has been purchased just below the Mesa Substation, which will make it possible to operate the two stations to better advantage. A residence is being built at the new substation, and pecan investigations will be undertaken on a considerable scale.

Range ecology is being organized as a major line of research and instruction through cooperation with the U. S. D. A. Biological Survey and Forest Service, the plant geography studies of President H. L. Shantz, the rodent investigations of the department of entomology, the stock poisoning investigations of the animal husbandry department, and the nutrition investigations of the dairy department. This project is attracting much interest in the State, including an enrollment of graduate students. The laboratory work at Phoenix is being expanded, and the department of agricultural chemistry is inaugurating studies of the soil conditions of the valley. Plans are also under way for additional irrigation investigations in cooperation with the U. S. Department of Agriculture.

The headquarters of the southwestern division of the Forest Service have been transferred to Tucson, where the university is furnishing quarters. It is expected that there will be 11 research men in forestry and range ecology who will have their headquarters at the university.

G. H. Serviss, research assistant in agronomy, has resigned to accept a position with the soil fertility investigations of the U. S. D. A. Bureau of Chemistry and Soils. W. F. Dickson, assistant professor of animal husbandry and assistant animal husbandman, has resigned to accept a fellowship in animal breeding at the Iowa College and has been succeeded by Dr. E. L. Scott of the Indiana Station. E. S. Turville, extension agronomist and irrigation specialist, has resigned to become county agent of Yavapai County.

Leaves of absence for graduate study have been granted to Charles Hobart, research assistant in agronomy and horticulture; H. C. Schwalen, associate professor of agricultural engineering and associate agricultural engineer; and Edith S. Ranney, associate professor of home economics.

Recent appointments include Dr. T. F. Buehrer as professor of agricultural chemistry and physical chemist vice Dr. O. C. Magistad, resigned to accept a position with the Hawaiian Pineapple Canners' Station; W. A. Steenbergen, assistant in agricultural engineering; Dr. George W. Barr, extension economist; Dr. Bernice C. Wait, associate professor of home economics vice Maude E. Jenkins, resigned; Edith Lantz, research assistant in nutrition, vice Mabel L. Lynott, resigned; and Robert H. Hilgeman, research assistant in horticulture. D. W. Albert, associate horticulturist, has been transferred entirely to station work in the Salt River Valley. The university work in agricultural education has been transferred from the College of Education to the College of Agriculture, in charge of L. D. Klemmedson as associate professor of agricultural education.

Colorado Station.—F. E. Goetz has been appointed associate in mechanical engineering, effective October 15, succeeding J. W. Sjogren, resigned.

Georgia Station.—A conference was held at the station on October 10 of about 40 individuals and agencies who had cooperated with the institution during the year in its program of research in the freezing of fruits. Those present inspected a rather large exhibit of frozen fruits and vegetables put up by the station and its cooperators, and were served a light luncheon of foods that had been frozen.

Elma Jones has been appointed specialist in rural sociology and entered upon her duties September 15.

Montana College and Station.—Dr. A. L. Strand has been appointed head of the department of entomology in the college and station, State entomologist, and secretary to the State board of agriculture.

Pennsylvania College and Station.—The seventy-fifth anniversary of the founding of the college was celebrated October 23–25. Among the features was an exhibit representing the various lines of work under way. A three-year building program involving an outlay of over $4,000,000 has recently been completed, including the reconstruction of Old Main, the first college building, which will house the college administrative offices and student union activities.

Philip D. Adams, assistant in agricultural and biological chemistry, has resigned to become research biochemist in the Skin and Cancer Hospital in Philadelphia.

Tennessee University and Station.—A conference of about 50 college and station workers was held at the station October 6, 7, and 8 to discuss and correlate the different phases of the liming problem and to point out those aspects that need additional study.

A. G. Burg, associate professor of agronomy in the Mississippi College, has been appointed assistant professor of agronomy.

Washington College and Station.—C. C. Prouty has been appointed instructor in bacteriology and assistant dairy bacteriologist vice Dr. L. A. Black, whose resignation has been previously noted. R. E. Hodgson has been appointed assistant in dairy husbandry in the main station and dairy husbandman of the Western Washington Station at Puyallup, in cooperation with the U. S. D. A. Bureau of Dairy Industry.

Second International Congress of Soil Science.—According to data supplied by Dr. C. F. Marbut, this congress met in Leningrad and Moscow from July 20 to 31. Several local excursions were made from both points for the purpose of studying soil conditions, including a day spent in the vicinity of Tsarskoe Selo in examining soil profiles developed in a sandy region where the layer of sand is underlaid by clay, a visit to one of the oldest forest experiment stations in Europe to observe the effect of drainage on forest growth as well as on the characteristics of the soil, a trip to a large area of peat deposits lying northeast of Leningrad, and a visit to an experiment station in the outskirts of Moscow, during which the characteristics were observed of soils which had developed under a variety of circumstances previous to the advent of man under the influences of forest cover. In the early Middle Ages these soils were cleared and cultivated for a thousand years or very nearly so, partly in crops but to a very great extent in grass, and then again in about 1870 planted to forest. The effect on soil character of these types of vegetative cover acting through different periods of time was clearly marked in the characteristics of the soil profile.

At the close of the meetings an excursion of 24 days was taken from Moscow south and southeastward to Tiflis on the south side of the Caucasus Mountains, westward from the latter to Sevastopol in the Crimea, thence northward to Kharkov, west again to Kiev, and thence northward to Moscow. During the progress of the excursion, soil profiles were examined at about 40 spots, each of which was selected by an expert for the purpose of illustrating some important soil characteristic or the result of some important soil-building process. The experiment stations at Jarozhilowo, Voronezh, Saratov, Batum, Yalta, and Kharkov were also visited during this excursion, as were the great tractor plant now being constructed at Statingrad, the agricultural machinery shop at Rostov-on-Don, the dam across the Dnieper River at Dnieperstoy, the great farm called the Gigant about 100 miles east of Rostov, and another devoted to a large extent to experimental work with agricultural machinery at Verblud.

During the sessions it was decided to hold meetings in the future at intervals of 5 years instead of 3 years as in the past. The next meeting is to be held in 1935 in England, with an excursion, for purposes of soil investigation in the field, to the Mediterranean region or possibly to the west coast of Africa.

The general officers chosen for the meeting are as follows: President, Sir John Russell; vice presidents, Drs. A. A. Jarilov and C. F. Marbut; and general secretary, Dr. D. J. Hissink of the Netherlands. The members of the general committee were requested to serve for another meeting interval. The presidents of most of the commissions were reelected for another term, but in accordance with a decision that presidents of commissions should hold office consecutively through two-meeting intervals only, Dr. A. F. Joseph was elected president of Commission V vice Dr. Marbut.

Necrology.—Dr. C. von Seelhorst, professor of agronomy in Göttingen University and distinguished especially for investigations on the water requirements of plants and the influence of different conditions on the utilization of soil water by plants, died suddenly July 6, in the seventy-eighth year of his age. Von Seelhorst determined the water requirements for normal yields of various crop plants as influenced by variety, character of the soil and climate, stage of growth, and fertilizers. He also studied the influence of fertilizers on the development and structure of crop plants, particularly wheat. He devised a special form of lysimeter for use in his work. The results of his more important investigations were reported in *Journal für Landwirtschaft.*

New Journals.—*Vierteljahrshefte der Polnischen Landwirtschaft* is being published quarterly and in the German language at Warsaw, Poland. In addition to reviews, statistics, and other data, the initial number contains the following articles: The New Poland-French Commercial Treaty and Agriculture, by L. Krawulski (pp. 5–15); The Combining of Rural Properties, by K. Kasiński (pp. 16–34); The Unification of Statistical Methods in the Handling of Agricultural Statistical Data, by S. Moszczeński (pp. 35–57); The Protection of Private Forests in Poland, by T. Swinarski (pp. 58–77); The Standardization of Exports of Agricultural Products from Poland, by W. Hoyer (pp. 78–88); and Investigations on the Rentability of Dwellings in 1926–27, by J. Curzytek (pp. 89–110).

The Philippine Agricultural Review has been rechristened *The Philippine Journal of Agriculture*, and is being published quarterly at Manila by the Bureaus of Plant and Animal Industry of the Department of Agriculture and Natural Resources. It will publish the results of research conducted by these bureaus and articles written by scientists in other institutions. The initial number contains the text of the act creating the Bureaus of Plant and Animal Industry, a résumé of the report of the Bureau of Agriculture for the year ended December 31, 1929, by S. Youngberg (pp. 37–121); Experiments on Cigarette Tobacco Production in the Cagayan Valley, 1925–1929, by D. B. Paguirigan (pp. 5–36); and Some Chemical Differences between Abacá and Canton Fibers, by H. E. Sherman (pp. 123–134).

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EXPERIMENT STATION RECORD

VOL. 63 DECEMBER ABSTRACT NUMBER No. 9

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The microbiology of starch and sugars, A. C. THAYSEN and L. D. GALLOWAY (*London: Humphrey Milford, Oxford Univ. Press, 1930, pp. VIII+336, figs. 3*).—The present is intended to supplement an earlier work by Thaysen and Bunker (E. S. R., 59, p. 202), and "taken together the two volumes endeavor to review the microbiology of the carbohydrates. . . . The volume has been written from the point of view of the research worker, and in addition to compiling existing knowledge it endeavors to point out paths which might be followed by workers who desire to extend their knowledge of the action of microorganisms on starch and sugar."

Part 1 gives an outline of the constitution, biochemical properties, and microbiological hydrolysis of starch, glycogen, and inulin, and the hydrolysis of tetra-, tri-, and disaccharides and of glucosides. Part 2 covers the fermentation of monoses and the dehydrogenation of the hexoses. Part 3 takes up the synthetic activities of microorganisms and the mucus fermentations; part 4, the microbiology of cereals and cereal products, including the microbiology of baking and diseases of bread; and part 5, the microbiology of sugarcane, sugar beets, and their juices, and the microbiological deterioration of sugar in storage.

Starch: Its chemistry, technology, and uses, L. EYNON and J. H. LANE (*Cambridge, England: W. Heffer & Sons, 1928, pp. VIII+256,* [*pls. 10*], *figs.* [*15*]).—The authors note that at the time of publication of the present book it had been about 45 years since a textbook dealing in a comprehensive manner with the chemistry and technology of starch had been published in the English language, and indicate as their object "a concise but fairly complete account of the chemistry of starch as it stands to-day, of the manufacture of starch and starch products in different countries, and of the uses to which starch and its products are applied." It deals with the history of starch, starch in its relation to plant metabolism, the constitution, properties, and microscopy of starch, the manufacture of potato, wheat, maize, and rice starch, other commercial starches, starch products, applications of starch and its products, and analysis.

Ubbelohde's handbook of the oils and fats, I, edited by H. HELLER (*Ubbelohde's Handbuch der Chemie und Technologie der Öle und Fette. Leipzig: S. Hirzel, 1929, 2. rev. ed., vol. 1, pp. XVI+791, pls. 17, figs. 439*).—This is the first volume of a second edition of this work. The contents are as follows:

Historical notes, contributed by H. Heller; the occurrence, formation, and use of fats and waxes in plants, by E. Gilg and P. N. Schürhoff; the occurrence, formation, and use of fats in the animal organism, by E. Eckardt; the chemistry of the fats and waxes, by K. H. Bauer; lipoids (phosphatids), by B. Rewald; and the manufacture of the oils and fats, by E. Böhm. The last-named section, nearly two-thirds of the text, is stated to make a partial use of the material of Ubbelohde, Haefcke, and Bornemann, prepared for the first edition. This section contains an introduction; parts 1, the raw materials and their pretreatment; 2, the working up of the raw materials; 3, the refining of the crude oils and fats; 4, the end products and their treatment; and 5, description of the complete layout of a plant.

An author and a subject index conclude the volume.

Oils, fats, and fatty foods, E. R. Bolton (*Philadelphia: P. Blakiston's Son & Co., 1928, 2. ed., pp. XVI+416, pls. 12, figs. 34*).—The plan of the first (E. S. R., 32, p. 312) has been retained in this second edition, but the additions and other changes include especially a chapter on nutritive value, concerned with those vitamins associated with oils and fats. The contents are as follows: General introduction; preliminary examination; general analytical methods; interpretation of analytical methods for oils and fats and of the analyses of typical samples; industrial production of vegetable oils and fats; butter and margarine; animal fats, fish, and marine animal oils; vegetable oils and fats; hydrogenation of oils; rancidity, preservatives, and coloring matters; cocoa, chocolate, and milk chocolate; feeding stuffs; milk; and the nutritive value of the edible oils and fats.

The molecular weight of lactalbumin, B. Sjögren and T. Svedberg (*Jour. Amer. Chem. Soc., 52 (1930), No. 9, pp. 3650–3654, figs. 2*).—The molecular weight and sedimentation constants of lactalbumin preparations from cow's milk, as determined by ultracentrifugal methods previously noted (E. S. R., 62, p. 606), indicated an inhomogeneous substance, molecular weight values of from 12,000 to 25,000 having been observed, while the mean sedimentation constant had a value of from two to three times 10^{-13}. Similar determinations made at various points in the process of purification indicated that "lactalbumin with the properties observed in the 'purified' product does not exist in the milk, but is formed during the process of 'purification,' especially by the action of ammonium sulfate of high concentration. The bulk of the material from which the lactalbumin is formed has a low molecular weight, not exceeding 1,000. The comparatively high molecular weight of the final product is a result of gradual aggregation of the material of low molecular weight originally present in the milk."

Similar observations of the variation of the molecular weight of casein, made in part by Carpenter at the New York State Experiment Station (E. S. R., 62, p. 606), indicated that "this property [of variable molecular weight] is, therefore, probably a characteristic of the milk proteins and may be of considerable physiological importance in nutrition."

The isolation of a cyclotripeptide from casein [trans. title], W. S. Salikow and E. A. Poschiltzowa (*Biochem. Ztschr., 221 (1930), No. 4–6, pp. 304–314*).—The authors effected hydrolysis by means of sulfuric in place of the more usual hydrochloric acid, heating 200-gm. portions of the casein with 800 cc. of a 2 per cent aqueous solution of sulfuric acid for 12 hours at 180° C. in an autoclave. This procedure was found especially suited to the isolation of the resistant cyclopeptides because of the very general breaking down of other complexes. A cyclopeptide considered to be cycloprolylprolylleucin was isolated in a quantity indicating a molecular weight for casein of 16,360. The comparatively close agreement of this figure with that of 16,000, estimated by Osborne from the sulfur content of casein, is noted.

The view that cyclopolypeptides rather than straight chain polypeptides constitute the actual building units of the protein molecule is considered to be supported by the results of the investigation here detailed.

Composition of the gum produced by root nodule bacteria, E. W. Hopkins, W. H. Peterson, and E. B. Fred (*Jour. Amer. Chem. Soc., 52 (1930), No 9, pp. 3659–3668*).—The gum to which reference is made in this contribution from the Wisconsin Experiment Station was precipitated from the pure culture products of the growth of three cross-inoculation groups of root nodule bacteria on synthetic media.

"The carbon content of this gum was variable, being 40.6 per cent in one sample and 36.4 per cent in another. Glucose was crystallized from the gum solution after hydrolysis and identified by its specific rotation (+53.2°). Glucosazone was prepared from hydrolyzed gum produced by pure cultures of red clover root nodule bacteria, *Rhizobium trifolii* 205 and 201, and pea root nodule bacteria, *R. leguminosarum* 311. Fermentation tests of the sugar from these two gums by pure cultures of known yeasts also indicated that the sugar was glucose. Fermentation tests by pure cultures of pentose-fermenting lactic acid bacteria showed the absence of a pentose sugar. The gums of *R. meliloti* 100, *R. trifolii* 205 and 201, and *R. leguminosarum* 311 contain uronic acid in amounts varying between 4.1 and 25.3 per cent ash-free basis. All of the results up to the present time indicate that these gums of the root nodule bacteria are complexes of glucose and a uronic acid, probably glucuronic acid."

Quantitative comparative studies of the adsorption of vitamins B and G from protein-free milk by Lloyd's reagent, N. Halliday (*Diss., Columbia Univ., New York, 1929, pp. 50, figs. 10*).—This dissertation reports in detail an investigation of the relative adsorption on Lloyd's reagent of vitamins B (F or B_1) and G at varying H-ion concentrations and proportions of the adsorbent, the materials in all cases being tested by feeding experiments with young rats. Protein-free milk freshly prepared from skim milk powder was used as the source of the two vitamins.

It was found that under the conditions of the experiment both vitamins were adsorbed by Lloyd's reagent, but that vitamin B was more completely removed from the solution than was vitamin G. Varying the amount of Lloyd's reagent from 40 gm. to 5 gm. per liter of solution did not appreciably affect the amount of vitamin G adsorbed, the proportion of this vitamin in the solid and liquid being 2 to 1. With all proportions of the adsorbent except the lowest amount, 5 gm. per liter, no vitamin B could be demonstrated in the filtrate, but with 5 gm. there was evidence of incomplete adsorption. Differences in H-ion concentration from pH 3 to 5 caused no differences in adsorption. About half of each vitamin was lost during the adsorption. This was shown to be due partly to oxidation at the time of adsorption. When this was prevented by bubbling nitrogen through the mixture, about two-thirds of the original vitamin G and three-fourths of the vitamin B could be recovered. No material rich in vitamin B and free from vitamin G was obtained, but the filtrates furnished some vitamin G relatively free from vitamin B.

A research after a colorimetric method for estimating the silverskin (anti-beri-beri-vitamin) percentage of rice, J. P. Spruyt (*Chem. Weekbl., 27 (1930), No. 20, pp. 298–304, fig. 1; trans. in Meded. Dienst Volksgezondh. Nederland. Indië, 19 (1930), No. 1, pp. 46–65, pl. 1*).—The method described was developed as the result of an attempt to find some more accurate means than analyses for phosphorus pentoxide of determining the relative value of various samples of rice as a source of antineuritic vitamin. The Jansen-Donath method of preparing vitamin B_1 concentrates (E. S. R., 57, p. 489) was used as the starting point, and after various failures a method was finally developed which, in comparative tests with pigeon feeding experiments and P_2O_5 determinations, is said to follow the feeding tests quite closely. The technic is essentially as follows:

Ten gm. of whole rice is shaken mechanically in a rocking apparatus for 20 hours with 5 gm. of norite, 5 drops of toluol, and 50 cc. of a solution containing 1 per cent of salicylic acid and 0.25 per cent of sulfuric acid. The extract is then filtered and 20 cc. of the filtrate pipetted into a centrifuge tube and treated with 4 cc. of 50 per cent phosphotungstic acid. It is then cooled for a few hours in a mixture of salt and ice to hasten the precipitation of the phosphotungstate and left for 12 hours in a thermostat at 30° C. After the addition of 0.5 gm. of finely divided filter paper, the material is centrifuged at 3,000 revolutions per minute and the clear liquid decanted. The precipitate is stirred twice with 20 cc. of the original solution, centrifuged again, and washed over into a wide-mouthed 500 cc. flask, where it is reduced with zinc to a brownish-red end point. The contents of the flask are completely washed over into a 250-cc. flask, and a little stannous chloride is added to stabilize the color. After cooling, the solution is made up to 250 cc., filtered, and the intensity of color measured in a colorimeter against a standard colored glass and corrected for the color of a blank run at the same time.

A new adiabetic calorimeter, W. H. Barnes and O. Maass (*Canad. Jour. Research, 3 (1930), No. 1, pp. 70–79, fig. 1*).—The apparatus is described and illustrated in constructional detail. "The novel feature of the new calorimeter is shown to be the radiation thermel for indicating any difference between temperatures of the inner calorimeter and the outer bath. This instrument consists of a multiple junction thermocouple of which one set of junctions receives heat from the inner calorimeter vessel by radiation. The accuracy of the calorimeter is shown to depend on the magnitude of the temperature drop in the inner vessel and on the method for reading the temperatures involved. In the experiments with ice a probable accuracy of about 0.2 per cent is obtained with temperature drops of the order of 2°, measurement of which is made with a Beckmann thermometer."

Copper-constantan junctions were used in the making of the thermometric unit, their preparation and combination being fully described. "With this arrangement a deflection of 0.1 in. from zero on the galvanometer scale corresponded to a temperature difference of about 0.0007° between the inner calorimeter and the outer bath."

Applied inorganic analysis, W. F. Hillebrand and G. F. E. Lundell (*New York: John Wiley & Sons; London: Chapman & Hall, 1929, XIX+929, figs. 40*).—The aim throughout this book has been to stress the preparation of the solution for the determination that is to be made, rather than to describe processes that can be used with certainty only in the specific applications for which they were devised.

Part 1 deals with general considerations—introduction, balance and weights, apparatus and reagents, common operations, special operations, and volumetric analysis; part 2, the determination of the elements; part 3, silicate rock analysis; part 4, carbonate rock analysis; and part 5, miscellaneous methods of analysis—soda-lime glass and bauxite or refractories of high alumina content.

The determination of sodium by the uranyl method [trans. title], E. Kahane (*Bul. Soc. Chim. France, 4. ser., 47 (1930), No. 4, pp. 382–404*).—The paper reports a detailed study of the precipitation, previously considered by Kolthoff (E. S. R., 58, p. 608), among others, of sodium as sodium magnesium uranyl acetate.

The sources of possible error were investigated, and applications of the reaction in the form of gravimetric, volumetric, and colorimetric methods for the determination of sodium were developed and are here presented in working detail. With the exception of those of the phosphates, the anions and cations usually present were found not to interfere in the determination as carried out by any one of the three forms in which the method was developed.

The gravimetric determination yielded an approximation of the order of 1 to 2 parts in 1,000, the volumetric procedure an accuracy to about 1 per cent.

On a new and sensitive test for ammonia [trans. title], K. G. Makris (*Ztschr. Analyt. Chem., 81 (1930), No. 5–7, pp. 212–214*).—A combined solution of silver nitrate and tannin was found to show an extreme sensitiveness to hydroxyl ions, a mixture of 5 cc. of 20 per cent silver nitrate solution with 1 cc. of a 5 per cent tannin solution having been found most suitable. It is noted that other concentrations of the reactive components may be used, but that it is best, especially if the reaction is to be brought about by warming, to avoid more concentrated solutions of the silver salt; and the reagent must in any event be mixed immediately before use.

The test is directed to be carried out by exposure of a drop of the reagent, or of a pledget of cotton saturated with the reagent, to the vapors produced by making alkaline the solution of the substance to be tested and warming as gently as possible. The hanging drop of the reagent placed near 0.1 cc. of a solution containing 1 part in 1,000 of gaseous ammonia showed a ring of reduced silver in from 3 to 4 seconds. When the test was made with 1 cc. of the solution to be tested, warmed gently in a test tube with a few drops of alkali solution, the saturated cotton wad held at the mouth of the tube clearly indicated ammonia present in quantities as small as 5 micrograms during a warming of about 20 to 25 seconds. It is noted that a warming appreciably longer than that last named renders the test distinctly unreliable, by reason of the effect of the heat in causing a reduction of the silver even in the absence of ammonia.

Estimation of nitrate nitrogen in plant juice: A study of the expression and clarification of the juice, D. E. Frear (*Plant Physiol., 5 (1930), No. 3, pp. 359–371, fig. 1*).—This is a contribution from the Rhode Island Experiment Station, in which are presented the results of an investigation designed to widen the field of usefulness of the Gilbert method, contributed from the same station (E. S. R., 61, p. 13), for the colorimetric determination of nitrates, phosphates, and potassium in the juices of crop plants. "The modified method . . . includes several refinements in technic that have improved the accuracy of the method. . . . It is recommended that the plant tissue be frozen and pressed after thawing rather than ground and squeezed through cloth by hand. The carbon black for decolorization has been omitted, and the quantities of reagents used for clearing the juice have been changed." A study of the recovery of nitrate nitrogen gave 90.05 per cent as the average of 25 determinations.

On the applicability of the iodocolorimetric principle to the determination of starch [trans. title], L. Paloheimo (*Biochem. Ztschr., 222 (1930), No. 1–3, pp. 150–172, figs. 5*).—One-gm. samples of the finely ground material of which the starch content was to be determined were made into a thin paste with cold water, enough boiling water to make a total volume of 400 cc. was added, the mixture was boiled 15 minutes, 20 cc. of N sulfuric acid was added, and the boiling was continued for another 15 minutes. The mixture was then cooled, and cold water was added to the exact volume of 400 cc. The mixture was filtered hot and rapidly cooled, and from this original solution was pipetted into the 500-cc. graduated flask such an aliquot as could be depended upon to contain somewhat more starch than that represented by 20 cc. of a standard solution made by treating 500 mg. of pure starch in the manner just outlined for the 1-gm. sample of the material to be examined. A little water was then added, followed by 5 cc. of a saturated solution of iodine in 5 per cent aqueous potassium iodide. The comparison solution was made by treating 20 cc. of the standard pure starch solution as indicated for the aliquot of the sample solution. Exactly 100 cc. of the sample solution was then placed in a glass cylinder and about 150 cc. of the comparison standard in another like cylinder of a diameter exactly the same as that of the first. Color match was obtained by the gradual dilution of the sample solution until the depth of color was the same in sample and standard solutions, the calculation depending simply upon the quantitatively determined dilution of the sample solution required.

The determination of cornstarch fraudulently added to egg powder [trans. title], COMTE (*Ann. Falsif., 22 (1929), No. 252, p. 600*).—According to this method, place 1 gm. of the powder in a centrifuge tube and add a mixture of 15 cc. of carbon tetrachloride with 5 cc. of ether, shake violently, and centrifuge at a low speed. The egg substance is stated to be floated by this procedure, while the starch collects at the bottom of the tube.

The determination of crude fiber with the use of a new form of filter [trans. title], K. FEIST and E. KUNTZ (*Ztschr. Untersuch. Lebensmtl., 59 (1930), No. 5, pp. 480–483, fig. 1*).—Following a brief review of numerous devices for the facilitation of the determination, in which review the more noticeable shortcomings of each method are pointed out, the authors describe an apparatus consisting essentially of the following parts: (1) A 60° porcelain funnel otherwise of the usual form but expanded at the edge of the cone to form a flat rim or flange upon which, sealed by a rubber gasket, is laid (2) a sieve plate having the form of a shallow dish. A circle of filter paper is placed over the openings of the filter plate, a "Cella filter" is placed upon the paper, and on this, in turn, is laid another gasket ring. There is added finally (3) a short cylinder provided with an external flat rim or flange which seats upon the last-named gasket ring. The entire assembly is clamped together by metal rings bearing, respectively, down on the flange of the uppermost section (3) and upward against the under surface of the flange of the funnel (1). The stem of the funnel passes through a stopper into a suction flask in the usual manner.

The apparatus was found to make possible a more accurate determination.

The determination of the so-called crude fiber.—A new method for the determination of crude cellulose in cacao [trans. title], K. KÜRSCHNER and A. HANAK (*Ztschr. Untersuch. Lebensmtl., 59 (1930), No. 5, pp. 484–494, fig. 1*).—A method for the determination of crude cellulose in cacao, serving equally well for fat-free and for unextracted samples and said to be quickly carried out, consisted essentially in boiling the sample (0.3 gm. of unextracted cacao substance) in a flask of about 30 to 35 cc. capacity with a mixture of 15 cc. of 80 per cent acetic acid and 1.5 cc. of nitric acid (sp. gr. 1.4) for from 20 to 25 minutes under an air-cooled reflux tube, followed by filtration through a coarse porcelain or glass filter and a washing with from 7 to 10 cc. of the hot decomposing reagent, hot water, a few drops of alcohol, 5 to 10 cc. of ether, a further 1 to 2 cc. of the hot reagent, and finally hot water until the acid has been entirely removed, all of the washings being first used to rinse out the flask in which the first treatment was made. The crude cellulose was weighed after drying at 105 to 108° C.

It is stated that the final product of this procedure has the characteristic color of good crude cellulose. From a cellulose sample (cotton) of 95 per cent cellulose content there was obtained very constantly from 92.0 to 92.5 per cent cellulose content value by the application of the method outlined. An added correction of 3 per cent of the cellulose actually obtained is therefore considered to indicate very closely the actual cellulose content of the sample examined.

Testing ice cream for butterfat, L. K. Crowe (*Nebraska Sta. Bul. 246 (1930), pp. 16*).—A study of nine different methods of testing ice cream for fat showed that each of the methods had one or more serious disadvantages. The following modified Babcock procedure was devised and checked against the Mojonnier procedure:

Frozen ice cream was melted in a closed jar at a temperature below 80° F. and mixed thoroughly by pouring from one container to another. Fruit and nut ice cream was strained to remove the coarser pieces. Nine gm. of the melted ice cream or ice cream mix were placed in a 10 per cent, 18-gm. test bottle. To this was added 5 cc. of reagent A (9 parts of normal butyl alcohol and 1 part of C. P. ammonium hydroxide by volume) and the contents shaken thoroughly. Thirty cc. of reagent B (equal parts by volume of sulfuric acid, sp. gr. 1.82 to 1.83, and 95 per cent ethyl alcohol) were added and the contents shaken until the curd was dissolved. The bottles were then placed in a water bath at from 175 to 180° for 15 minutes and shaken at least three times during the heating period. After removal from the water bath the bottle was centrifuged at the regular speed in a Babcock tester for 5 minutes, shaken thoroughly, water at 180° added to bring the fat column to within 0.25 in. of the neck, centrifuged for 3 minutes, more water added to bring the fat column into the neck of the bottle so that the extremities were between the 0 and 10 per cent graduations, and again centrifuged for 1 minute. After removal from the centrifuge the bottle was placed in a water bath at between 135 and 140° for 5 minutes, glymol added, and the fat column measured with dividers from the bottom of the lower meniscus to a line between the glymol and fat. The reading was then multiplied by two.

When reagent B was composed of 95 per cent ethyl alcohol and sulfuric acid, the average variation of 101 samples of ice cream from results obtained by the Mojonnier procedure was ± 0.1337 per cent, and when reagent B was composed of specially denatured alcohol (Formula 30) and sulfuric acid, the average variation of 119 samples was ± 0.1093 per cent.

This test is not proposed as a replacement of ether extraction methods, but as a substitute when such methods are not available.

METEOROLOGY

Agricultural meteorology, J. O. Irwin (*Nature [London], 126 (1930), No. 3166, p. 39*).—Commenting on the recent meeting of the commission of agricultural meteorology of the International Meteorological Organization at Copenhagen, previously noted (E. S. R., 63, p. 14), the author discusses briefly the present status of research in agricultural meteorology. He divides the problems of agricultural meteorology into two broad classes, macrocosmic and microcosmic. "In the first, we study the influence of weather on crop yields on a large scale, seeking to fill in the general lines of a broad picture by studying recorded crop and weather data over as many years as possible and using statistical methods to determine their interrelations. In the second, the physiological reactions of the plant to the principal weather factors in plant growth—light, heat, and moisture—are considered in detail by a careful study of particular phenomena in plant growth under the completely controlled conditions of the laboratory or in a small-scale field experiment where as many conditions are controlled as possible. The macrocosmic problem is the especial province of the statistician."

The importance of macrocosmic studies in crop forecasting is stated to be very great, but "valuable as it is to know the degree to which crop yields depend on particular meteorological variates such as rainfall or sunshine, we can not use our knowledge to the greatest advantage without knowing the reasons for these relations, and these can only be discovered by the microcosmic method. The position is being rapidly reached to-day in which the statistician who has discovered the existence of interrelations by the large-scale method is also consulted on the planning of detailed experiments by which the reason for these relations may be discovered. . . .

"While meteorological data have usually been considered accurate enough for the large-scale correlation of weather and crops, there is an influential body of opinion which considers that the meteorological data at present collected are inadequate for the intensive and detailed study of weather effects on growth phenomena." The latter view was especially emphasized at the London Conference of Empire Meteorologists, previously noted (E. S. R., 62, p. 611), as well as at the Copenhagen meeting.

Meteorology in agriculture, F. Eredia (*Internatl. Rev. Agr., Mo. Bul. Agr. Sci. and Pract. [Rome], 21 (1930), No. 1, pp. 1–3*).—Suggestions are made regarding the improvement of meteorological services so that they will be of greater benefit to agriculture.

"The cornfield's micro-climate," J. M. Aikman (*Science, 71 (1930), No. 1828, p. XII*).—In this brief review of a paper presented at the Des Moines meeting of the Ecological Society of America, it is stated that the author studied the microclimate of a cornfield as related to the corn plants themselves. "He set out instruments to measure the humidity and evaporating power of the air, the temperature of air and soil, and the intensity of sunlight. He measured three different plantings of corn in this way, one a field with two stalks to the hill, one with three, and one with five. In general, he found that the denser the stand the higher the humidity, the lower the evaporation rate among the stalks, and the less sunlight reached the lower leaves. The evaporation rate, for example, was 10 per cent higher in the 'thin' field than in the densely planted one. Missing stalks in the hills, causing irregular gaps in the field, introduced wide fluctuations in all the 'microclimatic' readings."

Weather and cotton production, J. B. Kincer (*U. S. Mo. Weather Rev., 58 (1930), No. 5, pp. 190–196, fig. 1; abs. in Bul. Amer. Met. Soc., 11 (1930), No. 8–9, pp. 158, 159*).—This article, supplementing one previously noted (E. S. R., 60, p. 357), reports further study of the relation of weather to cotton yields and boll weevil activity in the cotton-growing area of the United States during the period 1909–1928.

A method of computing cotton yields based on the results of this study is explained. Yield indexes were computed by methods of multiple correlation from data for yields as related to rainfall, humidity, sunshine, and temperature for the 10 principal cotton-growing States and for the cotton-growing region as a whole, and these were combined with revised indexes of reduction of yield due to the boll weevil in arriving at the final estimates. Comparison of actual and computed yields in different years of the period covered shows a high degree of correlation, and indicates that the method may be capable of giving accurate forecasts of the yield as early as September 1.

Weather abnormalities in the United States (seventh note): Trend of precipitation, A. J. Henry (*U. S. Mo. Weather Rev., 58 (1930), No. 6, pp. 249, 250, fig. 1*).—A comparison of precipitation in the United States during the 25-year periods 1871–1895 and 1896–1920 shows that precipitation of the second period was decidedly less than that of the first in northeast Texas through Louisiana and Mississippi to western Tennessee and the lower Ohio Valley, along the Atlantic coast from the Virginia Capes to Jacksonville, Fla., and in the upper Lake region from Alpena, Mich., to Milwaukee. A study of drought conditions in southeastern Virginia and the adjacent region in northeastern North Carolina established the fact that precipitation in this region has been less than normal for a number of years subsequent to 1900.

Climatological data for the United States by sections, [May–June, 1930] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 17 (1930), Nos. 5, pp. [202], pls. 2, figs. 5; 6, pp. [216], pls. 2, figs. 5*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for May and June, 1930.

Monthly Weather Review, [May–June, 1930] (*U. S. Mo. Weather Rev., 58 (1930), Nos. 5, pp. 179–230, pls. 11, figs. 13; 6, pp. 231–272, pls. 10, figs. 2*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for May and June, 1930, solar and aerological observations, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 5.—Predicting Minimum Temperature, Especially as a Function of Preceding Temperature (illus.), by E. S. Nichols, with discussion by F. D. Young (pp. 179–189); Weather and Cotton Production (illus.), by J. B. Kincer (pp. 190–196) (see p 808); Meteorology and Its Importance to Aviation, by W. J. Humphreys (pp. 196, 197); Ceiling and Visibility in the United States: Northeastern States, by C. G. Andrus (pp. 198, 199), Southeastern States, by J. A. Riley (pp. 199–201), Central States, by V. Jakl (pp. 201, 202), Rocky Mountain States, by H. M. Hightman (p. 202), and Pacific Coast States, by D. M. Little (pp. 203, 204); Average Visibility at Chicago Airport (illus.), by F. H. Weck (p. 204); Seeing the Inside of a Tornado (illus.), by A. A. Justice (pp. 205, 206); Tornado at Grand Rapids, Mich., May 2, 1930 (illus.), by W. H. Tracy (p. 206); Tornadoes in Michigan in May, 1930 (illus.), by D. A. Seeley (p. 207); and Tornadoes in Missouri, by W. S. Belden (p. 208).

No. 6.—Aviation Weather Hazards, by T. R. Reed (pp. 231–234); Special Series of Sounding-Balloon Observations Made During the Winter of 1927–28, by L. T. Samuels (pp. 235–245); Supersaturation and Icing of Airplanes, by W. J. Humphreys (pp. 245, 246); Relations Between Winters in Manitoba and the Following Spring in Eastern United States, by F. Groissmayr (pp. 246, 247); Weather Abnormalities in the United States (Sixth Note): Temperature Distribution (pp. 247, 248), and Weather Abnormalities in the United States (Seventh Note): Trend of Precipitation (illus.) (pp. 249, 250) (see above), both by A. J. Henry; and Record Rainfall for Miami, Florida, by G. V. Fish (pp. 251, 252).

SOILS—FERTILIZERS

[Soil Survey reports, 1925 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1925, Nos. 23, pp. 39, fig. 1, map 1; 26, pp. 46, fig. 1, map 1; 29, pp. 32, pls. 2, fig. 1, map 1; 30, pp. 34, fig. 1, map 1*).—Of these four surveys, Nos. 23 and 26 were carried out with the respective cooperation of the Indiana and Ohio Experiment Stations; No. 29, in cooperation with the Wisconsin Geological and Natural History Survey and the University of Wisconsin

College of Agriculture; and No. 30, in conjunction with the State Geological Survey and Experiment Station.

No. 23. This report is in two parts of which the first deals with the soil survey proper, the second with the management of the soils mapped and described.

Part 1. *Soil survey of Hancock County, Indiana*, W. E. Tharp and C. S. Simmons (pp. 1–28).—Hancock County, east-central Indiana, has in general a very gently rolling surface lying at the general elevation of about 800 to 900 ft. and occupying 196,480 acres. It is drained mainly by the East Fork White River, a number of creeks, and a well-developed system of ditch and tile drainage. Crosby silt loam, Brookston silty clay loam, and Miami silt loam, 35.5, 34.1, and 12.9 per cent, respectively, of the total area considered, are the types of areal importance among 13 here classified as representing each a separate series.

Part 2. *The management of Hancock County soils*, A. T. Wiancko and S. D. Conner (pp. 29–39).—This section gives analyses of the chemical composition of the soils classified in part 1, and, for the discussion of their management, divides them into five groups, light-colored silt loam upland soils, light-colored terrace soils, dark-colored upland and terrace soils, bottom lands, and muck soils.

No. 26. *Soil survey of Muskingum County, Ohio*, S. W. Phillips et al.—Lying southeast of the center of the State, Muskingum County has an area of 424,960 acres, consists, topographically, of a westward sloping plateau having a hilly or rolling surface, and is generally well drained by the Muskingum River and its tributaries.

In all, 24 types representative of 18 series are classified, with Muskingum silt loam and Zanesville silt loam, 50.9 and 10.3 per cent, respectively, of the total area, as the soils of predominant extent. There is an aggregate area of 2.1 per cent in rough stony land.

No. 29. *Soil survey of Sauk County, Wisconsin*, W. J. Geib et al.—Sauk County occupies an area of 538,880 acres in the south-central part of the State, is very generally well drained, and possesses as main surface features extensive areas of level river terraces, and of gently rolling lands, together with the more mountainous topography of the Baraboo Range.

The report classifies 17 series, represented by 31 types, of which Clinton silt loam and Dubuque silt loam lead, with 17.2 and 10.8 per cent, respectively, of the total area, and lists 12.8 per cent of rough broken land, alluvial soils 4.1 per cent, and peat 2.1 per cent as the unclassified material.

No. 30. *Soil survey of Prince Georges County, Maryland*, S. O. Perkins and S. R. Bacon.—Consisting of 310,400 acres in southern Maryland, the area considered in this report varies from flat to steeply rolling and depends for drainage upon the Potomac and Patuxent Rivers. Though surface drainage is generally satisfactory, "tidal marsh, meadow, and a few areas of other soils are poorly drained."

Leonardtown silt loam with 18.5 per cent of the total area, Sassafras gravelly loam with 16.3 per cent, Collington fine sandy loam (of which about 7 per cent is a poorly drained phase) with 14.9 per cent, and Sassafras fine sandy loam with 14.8 per cent are the extensive types listed. Meadow and tidal marsh, 6.6 per cent, are unclassified materials also listed.

[Soil Survey Reports, 1926 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1926, Nos. 13, pp. 21, pls. 2, fig. 1, map 1; 14, pp. 52, fig. 1, map 1*).—The reports here noted were prepared with the cooperation, respectively, of the Wyoming Experiment Station and of the University of Nebraska State Soil Survey Department.

No. 13. *Soil survey of the Wheatland area, Wyoming*, E. J. Carpenter et al.—The Wheatland area includes 234,240 acres in Platte County, southeastern Wyoming, and forms part of the high plains area. Fort Collins loam occupies 25.7 per cent of the area included in the survey, Larimer gravelly loam 15.7 per cent, these two soils constituting, with the exception of 20 per cent of rough, broken, and stony lands, the important soil areas mapped. Five series were found to include 11 types.

No. 14. *Soil survey of Keith County, Nebraska*, M. H. Layton and W. H. Buckhannan.—Keith County, southwestern Nebraska, has an area of 694,400 acres, possesses the topographic features of the Great Plains region, of which it forms a part, and has drainage both to the North Platte and to the South Platte Rivers, with their tributaries.

Rosebud gravelly sandy loam, 9.3 per cent, leads in areal extent a total of 25 types representative of 14 series, while 32.7 per cent of dune sand and river wash amounting to 0.2 per cent constitute the material not classified.

Soil acidity from the viewpoint of the agricultural chemist, H. Kappen (*Die Bodenazidität nach agrikulturchemischen Gesichtspunkten Dargestellt. Berlin: Julius Springer, 1929, pp. VII+363, pl. 1, figs. 35*).—The author gives it specifically as his purpose to produce neither a monograph on soil acidity nor a bibliographic review, but, on the basis of such work as has proven most fruitful or has yielded important advances, to present an easily understandable and at the same time fundamental exposition of the most important questions concerning soil acidity. The chapters are as follows: The nature of the acidity of mineral soils; the soil reaction; the determination of soil reaction; the behavior of acid soils toward acids and bases and their neutralization and buffer actions; the behavior of acid soils toward the solutions of salts—(1) the action of hydrolyzable salts in acid soils and hydrolytic acidity; the behavior of acid soils toward solutions of salts—(2) exchange acidity; the behavior of acid soils toward solutions of salts—(3) the decomposition of neutral salts by humus substances and the active acidity; the absorptive power of acid soils; the importance of acidification in connection with the physical properties of soils; the influence of the reaction upon the microorganisms of the soil; the importance of soil reaction in plant physiology; the occurrence and distribution of soil acidification; the influence of fertilizer materials on soil acidity; the counter action of the damage caused by soil acidity by means of liming; and the application of artificial fertilizers to acid soil. A short author index and a subject index of similar proportions are appended.

Seasonal fluctuations in numbers of microorganisms and nitrate nitrogen in an Alberta soil, J. D. Newton (*Sci. Agr., 10 (1930), No. 6, pp. 361–368, figs. 2*).—Though no close correspondence between nitrate fluctuations and those of the numbers of bacteria, of fungi, or of actinomycetes appeared in these experiments of the University of Alberta, the highest percentages of moisture and of nitrate nitrogen and the largest bacterial numbers did occur together in the fallow land, while the minimum in moisture and nitrate percentages and in bacterial numbers was found in the grass land.

"The numbers of fungi were very much smaller than the numbers of bacteria, but usually varied in the same direction as the bacterial numbers. The actinomyces numbers were, on the average, considerably smaller than the bacterial numbers, and varied somewhat irregularly. The numbers of bacteria present were generally much smaller than at Rothamsted, and smaller, apparently, than in some of the more humid areas of eastern North America. In both seasons the bacterial numbers attained a spring maximum."

Early versus late ploughing of sweet clover for green manure, D. H. Jones and E. H. Garrard (*Sci Agr., 10 (1930), No. 6, pp. 419–422*).—The work here reported from the Ontario Agricultural College was designed to answer the question whether the increased nitrogen content of late plowed sweetclover will pay for the inconvenient late plowing.

"The nitrogen content of a sweetclover crop that was intended for green manure was determined weekly from April 26 until June 17 to ascertain the advisability of leaving the crop as long as possible before plowing it in on account of increase of nitrogen. From April 26 to May 23 there was an increase of total nitrogen from 13.8 to 76.1 lbs. per acre. During the next three weeks this amount of nitrogen was again nearly doubled, rising from 76.1 to 133.1 lbs. per acre. The percentage of this nitrogen that was obtained from the atmosphere was not determined."

Composition of natural organic materials and their decomposition in the soil.—V, Decomposition of various chemical constituents in plant materials, under anaerobic conditions, F. G. Tenney and S. A. Waksman (*Soil Sci., 30 (1930), No. 2, pp. 143–160, figs. 8*).—Cornstalks, rye straw, oak leaves, freshly harvested alfalfa, and the green portions of sphagnum plants, materials of which the aerobic decomposition has been taken up (E. S. R., 62, p. 414) in this series of papers from the New Jersey Experiment Stations, were subjected, in the experiments here reported, to a decomposition anaerobic in so far as it was possible to exclude air by saturating and covering the substances treated with distilled water. The proximate composition of the initial material and that of the decomposition products at various stages of microbiological breakdown were studied by methods outlined in the first (E. S. R., 58, p. 508) of these papers.

"Under anaerobic conditions, plant materials as a whole decompose much more slowly than under aerobic conditions. The difference in the rapidity of decomposition of the various chemical constituents is even more striking. This is true especially of the lignins and organic nitrogenous complexes when compared with the decomposition of the celluloses and hemicelluloses."

It is further stated, with respect to the formation under natural conditions of two distinct types of peat, that "the studies reported here on the anaerobic decomposition of cornstalks, rye straw, and oak leaves, on the one hand, and of sphagnum, on the other, readily explain these differences in the chemical composition of the two types of peat. The lowmoor peat is made up of plants in which the celluloses and hemicelluloses decompose rapidly while the lignins and proteins accumulate, the latter through the synthesizing agencies of microorganisms that use the polysaccharides as sources of energy. In the decomposition of sphagnum plants, low in lignins, in highmoors, the organic nitrogenous complexes are rapidly attacked; the nitrogen thereby made available can not be utilized by microorganisms in the absence of readily available sources of energy, since the polysaccharides of the sphagnum are rather resistant to decomposition."

The separation of two products of the solubilization of sulfur in a soil containing added organic matter [trans. title], **G. Guittonneau and J. Keilling** (*Compt. Rend. Acad. Sci. [Paris], 191 (1930), No. 5, pp. 277–279*).—The senior author having already shown the presence of thiosulfates in soils in which had been effected the biological oxidation of sulfur (E. S. R., 57, p. 811), there were brought about the actual isolation and identification of thiosulfuric acid, in the form of the double thiosulfate of potassium and bismuth, identifiable by its crystalline form and a quantitative analysis; and, from extracts of soils in which sulfur had been oxidized without the subsequent presence of determinable proportions of thiosulfate, the isolation as the potassium salt of pentathionic acid.

In the case of the last-named oxidation product, three liters of a soil extract free from thiosulfate were concentrated, at 50° C. and under reduced pressure, to less than 1 liter, sulfates were removed by treatment with barium chloride after adding acetic acid, and the solution was treated with 5 gm. of potassium acetate and 9 times its volume of a mixture of 1 part of alcohol with 2 parts of ether. Holding this mixture at about 0° C. for 24 hours the authors obtained several grams of crystals, which were purified by recrystallization from 1 per cent sulfuric acid, air drying, and washing with alcohol, and were finally dried by heat. The analysis of the substance thus obtained corresponded closely with the theoretical composition of potassium-pentathionate trihydrate, there being found sulfur 41.2 and potassium 19.8 per cent, respectively; and for $K_2S_5O_6 \cdot 3H_2O$, sulfur 41.2 and potassium 20.1 per cent, respectively.

Exchangeable cations and lime requirement in differently fertilized soils, S. Ravikovitch (*Soil Sci., 30 (1930), No. 2, pp. 79–95, figs. 3*).—The effects of a variety of fertilizer treatments on the exchangeable calcium and magnesium contents, on the degree of unsaturation, on the lime requirement, and on the reaction of a New Jersey Experiment Station Sassafras loam of the low exchange capacity of 4.5 and 5.69 milliequivalents in 100 gm. of the untreated and of the limed soil, respectively, constitute the major part of the object of the experiments here reported.

"The calcium carbonate in all cases increased considerably the amount of exchangeable calcium. The superphosphate increased to a certain degree the amount of the exchangeable calcium. The muriate of potash is found to remove the exchangeable calcium both in the unlimed and limed soils. The ammonium sulfate appeared to have the most exhaustive action in removing the exchangeable calcium from the soil. The greatest effect was produced on the unlimed soil. The application of manure increased the total base-exchange capacity of the soils and, in the limed plat, the amount of the exchangeable calcium. The unlimed soils were found to be highly unsaturated, the degree of unsaturation being influenced by the fertilizer applied. A correlation was found between the lime requirement and the pH value in both the unlimed and the limed soils."

An ancillary methodological study led to the conclusion that "Hissink's correction for the dissolved calcium carbonate was . . . unsatisfactory for the limed Sassafras soils. Gedroiz's and Tyurin's methods were found to give almost identical results for the amount of calcium carbonate dissolved."

Availability of manganese and of iron as affected by applications of calcium and magnesium carbonates to the soil, H. B. Mann (*Soil Sci., 30 (1930), No. 2, pp. 117–141, pls. 4, figs. 2*).—In agreement with the original observation by the Rhode Island Experiment Station of a specific cure of a chlorosis (in spinach) by manganese (E. S. R., 54, p. 450) it was the experience of the North Carolina Station that the "chlorosis of soybeans grown on certain heavily limed soils is not associated with a deficiency of iron, but is specifically due to a deficiency of manganese." The solubility of iron and manganese in soils, the iron and manganese content of plants, and the response to the application of various salts (manganese sulfate, sulfate, citrate, tartrate of iron, copper sulfate, barium chloride, and magnesium sulfate) support the conclusion indicated.

[Fertility tests at the county experiment farms in 1929] (*Ohio Sta., Co. Expt. Farms Rpts. 1929, Miami Co. Farm, pp. 1–4; Trumbull Co. Farm, p. 1*).—Favorable results from the use of superphosphate, potash, manure, and lime on Miami and Trumbull County soils are briefly noted.

AGRICULTURAL BOTANY

The relation between vessel diameter and flow of water in the xylem of the apple, J. R. Furr (*Amer. Soc. Hort. Sci. Proc., 25 (1928), pp. 311–320*).—A discussion of the data, which are tabulated as resulting from tests made, emphasizes the statement that not all the factors affecting the rate of sap flow in trees are easily determined. In the lower regions of the trees the xylem is more efficient per unit area of cross section than in the upper regions, though the relatively large additive cross-sectional area at the higher levels may largely or entirely compensate for the relatively low efficiency per unit area in cross section. "It seems, therefore, that in regions at different levels of the tree there must be a nice balance between the capacities for conduction of water." The supposed influence of pruning is discussed.

The transpiration rate of the pinto bean, T. M. Currence (*Amer. Soc. Hort. Sci. Proc., 25 (1928), pp. 41–44, figs. 2*).—In a study made at the Oklahoma Experiment Station to compare the water relations of the pinto bean with those of a standard garden variety, Stringless Green Pod, hermetically sealed pots were used, and the water loss from each variety during one week was ascertained.

The loss of water per square meter of leaf area averaged 48.13±0.83 for pinto and 42.29±1.29 for Stringless Green Pod. Pinto proved to have, however, a significantly greater root system in proportion to its leaf area than had the Stringless Green Pod. This, it is thought, may suggest an explanation of the drought resistance of pinto. Brief discussions are given of the limitations of the conditions as employed.

Rate of respiration as related to age, J. M. Hover and F. G. Gustafson (*Jour. Gen. Physiol., 10 (1926), No. 1, pp. 33–39, figs. 4*).—It is claimed that as leaves of corn, sorghum, wheat, and oats increase in age a decrease in respiration goes on to about middle age, after which the rate gradually increases.

Mineral nutrition in the living cell, vitamins, and natural resistance to infectious diseases [trans. title], P. Mazé (*Ann. Inst. Pasteur. 41 (1927), No. 9, pp. 948–981*).—In the course of work previously noted (E. S. R., 31, p. 221; 34, p. 627), the author observed a number of facts presenting many analogies with certain facts observed by some others working on accessories of alimentation.

Sections of the present report relate to mineral nutrition and vitamins in higher plants; accessory factors of alimentation; formation of substances in plants; resistance of plants to parasitic diseases and to animal parasites; and mineral nutrition and natural immunity in animals. Conclusions are detailed with discussions.

Immunity, in the forms which are observable, is thought to depend definitively upon the actual chemical capabilities of the organism. It appears in connection with mineral poisons as well as with plant or animal toxins. The result is simple, but the defensive reaction is complicated. The neutralization or even the destructon of true toxins is the same as regards the principle of the chemical mechanism, and no great difficulty is presented to an organism which is physiologically vigorous.

Exit of dye from living cells of Nitella at different pH values, M. Irwin (*Jour. Gen. Physiol., 10 (1926), No. 1, pp. 75–102, figs. 4*).—In papers previously noted (E. S. R., 61, p. 513), a theory was upheld which regarded the rate of penetration and the final equilibrium as dependent primarily upon the concentration of the salts of proteins or weak acids at the surface of the cells which combine to form a compound capable of diffusing into the sap. It is stated that further experimentation has shown many objections to this theory, and the present paper is intended to outline a theory of the penetration of the dye (brilliant cresyl blue) into living cells of Nitella and to examine how far this theory is in harmony with the facts found in studying the exit of the dye from the cell.

In solutions of varying external pH values containing no dye, confirmation is said to have been obtained of the theory that the relation of the dye in the sap to that in external solutions depends on the fact that the dye exists in two forms, one of which (DB) can pass through the protoplasm more readily than the other (DS). DB increases by transformation of DS to DB with an increase in the pH value, and is soluble in chloroform and benzene. DS increases with decrease in pH value and is nearly insoluble in chloroform and benzene.

The exit rate of the dye increases as the external pH decreases, also when the pH value of the sap is increased by penetration of NH_3.

The penetration of basic dye into Nitella and Valonia in the presence of certain acids, buffer mixtures, and salts, M. Irwin (*Jour. Gen. Physiol., 10 (1926), No. 2, pp. 271–287*).—In view of the finding, previously noted (E. S. R., 61, p. 513), that the pH value of the cell sap plays an important rôle in the accumulation of brilliant cresyl blue in the living cell of Nitella, and in view of the fact that it appears important to study the changes in the rate of penetration produced by varying the pH value of the sap, the present paper deals with experiments on the rate of penetration of the dye in the presence of acids and buffer mixtures. The experiments are of interest in connection with the hypothesis that brilliant cresyl blue exists in aqueous solution in two forms, DB and DS. DB, the form which predominates at higher pH values, represents a free base, while DS exists predominantly at lower pH values and is a dissociated salt. A normal living cell of Nitella is assumed to be permeable chiefly to DB and very slightly to DS. Both the method and matters presented in tabular form are described in some detail.

Preliminary report on amino acid synthesis in plants, W. F. Loehwing (*Iowa Acad. Sci. Proc., 34 (1927), pp. 115–118*).—It is supposed that the formation of fruit robs the vegetative structures of the normal tomato plant of nitrates, ammonia, and amino acids. In defruited plants supplied with nitrate fertilizer, this is absorbed as such, accumulated in the vicinity of the meristem, and there reduced to nitrites, ammonia, and amino acid, this reduction being most marked in alkaline tissues about the pericycle. Judging from the behavior of the expressed sap, this alkalinity and the presence of sugars are indispensable for nitrate reduction and amino acid formation, the steps in the process thus being nitrates to nitrites to ammonia to amino acids in the presence of sugars. Reduction is not enzymatic, as the boiled expressed sap reduces as efficiently as does the unboiled.

Concerning the influence of polarized light on the growth of seedlings, D. I. Macht (*Jour. Gen. Physiol., 10 (1926), No. 1, pp. 41–52, figs. 4*).—Experimentation admittedly not exhaustive but said to be reasonably convincing, led to the statement that the effect of polarized light of the visible spectrum on the growth of various seedlings, particularly *Lupinus albus*, is somewhat different from and more effective than that of nonpolarized light as regards growth.

Plagiotropic growth in plants [trans. title], W. Zimmermann (*Naturwissenschaften, 15 (1927), No. 45, pp. 889–895, figs. 7*).—An attempt is made at qualitative and quantitative analysis of tropisms in plants, which become manifest during their growth so as to affect both appearance and values.

GENETICS

Variation and hereditary statistics, F. Bernstein (*Variations- und Erblichkeitsstatistik.* In *Handbuch der Vererbungswissenschaft. Berlin: Borntraeger Bros., 1929, vol. 1–C, pp. IV+96, figs. 7*).—An account is given of the principles involved in statistical studies, and statistical methods of primary importance in the study of hereditary problems are described.

Microsporogenesis in the Cucurbitaceae, S. F. Passmore (*Bot. Gaz., 90 (1930), No. 2, pp. 213–223, figs. 40*).—Cytological examination at the University of Pennsylvania of the staminate buds of plants of *Cucurbita pepo, C. maxima, Citrullus vulgaris, Luffa cylindrica,* and *Cucumis melo* showed 20, 20, 11, 11, and 12 bivalent chromosomes, respectively. The homologous chromosomes were observed to pass to the poles at anaphase, with no evidence of lagging in any species except *C. sativus*, where the chromosomes were distributed irregularly on the spindle at anaphase. Nucellar budding was apparent in both *L. cylindrica* and *C. sativus*, and was seen in these species even after the appearance of the spindle fibers.

Meiosis in a triploid Fragaria, S. H. Yarnell (*Natl. Acad. Sci. Proc., 15 (1929), No. 11, pp. 843, 844*).—Cytological examination of the buds of a triploid form of Fragaria showed pairing of the nonhomologous chromosomes, that is, instead of the expected 7 trisomes or 7 disomes plus 7 monosomes there were 10 disomes plus an unpaired chromosome. Not infrequently a secondary association was observed in which there were three groups of four, one group of three, and three groups of two chromosomes. The pairing of nonhomologous chromosomes is conceded to be contrary to Mendelian theory of heredity.

The inheritance of dormancy and premature germination in maize, P. C. Mangelsdorf (*Genetics, 15 (1930), No. 5, pp. 462–494, fig. 1*).—Report is made on further studies on the inheritance of several forms of premature germination (E. S. R., 55, p. 428) noted previously, the verification of several hypotheses already presented tentatively, and a study of new types more recently discovered. The investigations were made at the Connecticut State Experiment Station from 1921 to 1926 and at the Texas Experiment Station from 1927 to 1929.

Premature germination, an inherited character in which seeds fail to maintain dormancy during development and germinate before maturity, has appeared in many different stocks of corn, in several cases when two stocks were crossed, and in others in the second and third generation of inbreeding. At least 15 different genetic factors and 9 distinct characters have been shown to be involved in the inheritance of premature germination. Recognizable differences have been noted between some of the types in the time at which germination begins as well as in other phenotypical characteristics.

Of the characters 6 appeared to be the result of complementary factors and to be inherited in ratios of 3:1, 9:7, and 27:37, depending on the number of factors involved in the cross. Three characters were found to be governed by duplicate, triplicate, or quadruplicate factors and inherited in ratios of 15:1, 63:1, and 255:1. The ratios of 8:1 and 35:1 were interpreted as a result of triplicate factors, two of which are linked with approximately 33 per cent of crossing over. The combinations of 3:1 and 15:1 ratios produced a ratio of 45:19, and combinations of 9:7 and 15:1 ratios resulted in a ratio of 135:121. Of the different Mendelian ratios met with practically all have been verified by the data from F_3 progenies.

An inheritance study of the distribution of vitamin A in maize, II, III (*Jour. Biol. Chem., 86 (1930), No. 1, pp. 161–172, figs. 2*).—Two further contributions are presented by the Indiana Experiment Station (E. S. R., 60, p. 810).

II. *Vitamin A in hybrid red maize*, S. M. Hauge (pp. 161–165).—In hybrid red corn vitamin A was found to be associated with yellow endosperm and lacking in the kernels with pure white endosperm, even when grown on the same ears as those possessing kernels with yellow endosperm. The color of the pericarp appeared to have no effect on the vitamin A content of corn.

III. *Vitamin A content in relation to yellow endosperm*, S. M. Hauge and J. F. Trost (pp. 167–172).—In cooperation with the U. S. Department of Agriculture, the vitamin A content was compared in two classes of dent corn, *YYY* (Reid Yellow Dent) and *Yyy* (F_1 Johnson County White×Reid Yellow Dent), possessing as wide a range of yellow endosperm character as possible. The critical level for the *Yyy* corn approximated 15 per cent and of the *YYY* corn about 5 per cent. Seven per cent of *YYY* corn gave good growth, whereas 20 per cent of *Yyy* corn was needed for comparable results. The vitamin A content of dent corn seemed to be controlled by ordinary hereditary factors, the same as those governing development of the yellow endosperm.

Vigor in soybeans in relation to inhibition of pubescence, C. VEATCH (*Jour. Amer. Soc. Agron., 22 (1930), No. 5, pp. 446–452*).—In soybean crosses at the Illinois Experiment Station, involving the dominant factor P_1 which inhibits the expression of pubescence, the F_1 was below the average of the parents in vigor. In most of the characters studied the hybrid resembled the glabrous more than the pubescent parent. F_2 results indicated a close relationship between pubescence and vigor or plant development. The recessive pubescent F_2 segregates exceeded the glabrous parents in average height and number of seeds per plant. No significant difference was noted in the development of the heterozygous glabrous F_2 plants and those homozygous for P_1. The glabrous parental plants were comparatively small and poorly developed. There seemed to be a very close relationship between P_1 and vigor. P_1 either has a double effect in reducing vigor as well as inhibiting pubescence or is very closely linked with factors that reduce vigor and development. See also an earlier note (E. S. R., 61, p. 723).

Flower buds in cotton bolls, J. W. HUBBARD (*Jour. Heredity, 21 (1930), No. 6, pp. 274–277, figs. 2*).—An aberrant in the Acala variety of cotton is described.

A defective seed-coat character in soybeans, R. T. STEWART and J. B. WENTZ (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 658–662, fig. 1*).—Soybean seeds with seed coats netted and cracked in varying degrees, especially around the edges of the cotyledons, were observed at the Iowa State College on certain F_2 plants of Wisconsin Black×Mandarin. The defect was exhibited by plants bearing buff or imperfect black seeds but never by plants with brown or black seeds. Many of the seeds were split in threshing, for the seed coat was cracked almost entirely around the seed. Further study showed the defect to be caused by a recessive factor *de* which is inhibited by *I*, which also inhibits pigment colors giving yellow seed coats. The factor *de* showed complete linkage with the factor *t* for gray pubescence; all plants bearing seeds with defective seed coats had gray pubescence.

Causes of difference in success of reciprocal interspecific crosses, W. P. THOMPSON (*Amer. Nat., 64 (1930), No. 694, pp. 407–421*).—In a review citing 44 titles, the author states that in crosses between species which differ in chromosome number the cytological situation in the endosperm depends on the direction of the cross. If the species with the larger number is used as the female the chromosomes which it possesses and which the other lacks will be doubled in the endosperm, whereas in the reciprocal cross they will be single. In wheat (E. S. R., 63, p. 429) the endosperm in which the excess chromosomes are doubled is normal, whereas that in which they are single is shriveled. Consequently when the species with the larger number is female the cross is more successful than when it is male. As a rule the results are similar in other genera of plants. In cases in which reciprocal interspecific crosses differ in success the more successful is generally the one in which the species with the larger chromosome number is used as the female. There are also other causes of a difference in success, such as a difference in the length of the styles or possibly a faulty interaction of the cytoplasm of one parent and the genes of the other.

Breeding "crossed eggplants" in Japan, Y. KAKIZAKI (*Jour. Heredity, 21 (1930), No. 6, pp. 253–258, figs. 4*).—At the Saitama Agricultural Experiment Station, Japan, sufficient F_1 eggplant seed is produced each year to plant about 100 acres of commercial fields. Of 41 intervarietal crosses originally made in an effort to locate the best parental combinations, 37 were more productive than the average of the two parents, the range being from —43.7 to 152 per cent, averaging 36.1 per cent. Crosses between diverse types tended to give the highest degree of hybrid vigor. In branching habit, size of leaflets, and shape of fruit the F_1 plants were generally intermediate. In color of fruits black was dominant over white, being apparently controlled by a single genetic factor.

[Animal breeding research department, University of Edinburgh, eighth and ninth annual reports, 1927–28 and 1928–29], F. A. E. CREW ET AL. (*Edinb. Univ., Anim. Breeding Research Dept. Rpts. Dir., 8 (1927–28), pp. 12; 9 (1928–29), pp. 19*).—These publications summarize the activities of the animal breeding research department of the University of Edinburgh for the years 1927–28 and 1928–29, and include lists of the papers published.

The genetics of the fowl.—I, The inheritance of frizzled plumage, F. B. HUTT (*Jour. Genetics, 22 (1930), No. 1, pp. 109–127, pls. 2, figs. 2*).—In a study of inheritance of frizzled plumage it was found that this characteristic was dominant to normal plumage. There was, however, a phenotypic difference between heterozygous individuals. Studies of the fertility during incubation failed to show evidence of any lethal action of the gene for frizzling, and several individuals showing extreme frizzling proved to be homozygous. The reputed inability of Frizzles to breed true appears to have arisen on account of the preference of the fancier for the heterozygous type of fowl. Homozygous frizzled birds are ordinarily discarded.

Further data on a case of autosomal linkage in the domestic fowl, L. C. DUNN and W. LANDAUER (*Jour. Genetics, 22 (1930), No. 1, pp. 95–101*).—Data are presented which indicate linkage between the characters dominant white, polydactyly, and hernia in poultry.

On pigment formation in the D-black rabbit, P. KOLLER (*Jour. Genetics, 22 (1930), No. 1, pp. 103–107*).—In a study of pigment formation, extracts of the skin of agouti, recessive black, dominant black, dominant white, albino, chocolate, and agouti-Dutch rabbits were prepared. Small quantities of Dopa (dioxyphenylalanine), Dopa and water, and Dopa and an extract of white skin or the belly skin of agouti rabbits (inhibitors) were added to different portions of the above extracts. After standing for 4 hours at 37° C. and 8 hours at room temperature the extracts of the colored skin, agouti, dominant black, recessive black, and chocolate produced a dark color when Dopa and Dopa and water were added. Neither extracts of the colored skin alone or with the addition of extracts of white or belly skin of agouti animals produced color except in case of the dominant black. It is suggested that a substance is present in the dominant black skin which inhibits the action of the inhibitor. Extracts from dominant white, recessive white, and agouti belly did not produce any pigment even with the addition of Dopa alone.

The inheritance of butter-fat percentage in crosses of Jersey with Red Danes, C. Wriedt (*Jour. Genetics, 22 (1930), No. 1, pp. 45–63, figs. 15*).—Based on the butterfat percentage in the milk of Jersey and Red Dane cattle and 108 F_1 hybrids, 42 back-crosses to Red Dane bulls, and 49 back-crosses to Jersey bulls, the author concludes that one genetic factor is responsible for the difference between the two breeds. The gene for high fat content had an equal effect whether it was united with a gene for high or low fat production. There was also indication that some Jersey bulls carried a modifying gene for increased fat percentage.

The fat percentage of an individual was based on the average for the third to the sixth month of lactation. Red Dane cows as a whole averaged 3.40 per cent, Jerseys 5.57 per cent, F_1s 4.39 per cent, Red Dane back-crosses 4.4 per cent, and Jersey back-crosses 4.82 per cent.

Some observations on the degeneration of the testes in the guinea-pig, F. E. Emery (*Anat. Rec., 44 (1930), No. 4, pp. 369–379, figs. 4*).—The condition is described of the testes of guinea pigs which were injected intraperitoneally at intervals of 3 to 7 days with suspensions of trout spermatozoa. The rectal temperatures of the animals were closely observed. After 15 or more injections the testes were removed for study.

The testes of the treated animals showed degenerate tubules with slight to complete desquamation of the reproductive cells. As the mean rectal temperatures were not significantly different from those of the controls, and as the inguinal canals were closed so that the testes could not be drawn into the abdomen, it is concluded that increased temperature was not the cause of the degeneration. The testes of guinea pigs similarly injected with egg white were normal.

These findings support the idea that spermatozoa suspensions have a specific effect on the germinal tissue. The animals injected with trout spermatozoa were healthy and retained their sexual desire. Though several attempts were made to mate these males with normal females, there were no cases of pregnancy.

The effect of breeding immature ewes, J. E. Bowstead (*Sci. Agr., 10 (1930), No. 7, pp. 429–459, figs. 2*).—The results of a study of the influence on the ewe and the offspring of breeding ewe lambs under one year of age, as compared with breeding ewes at two and three years of age, are reported.

The study showed that there were more unsuccessful matings with ewe lambs than with ewes first bred in their second year, but breeding ewes as lambs did not decrease the mature weight. The first crop of lambs produced by ewe lambs was smaller and lower in vitality than the first crop of lambs produced by yearling ewes, but the quality of lambs produced was, if any different, slightly in favor of the ewes which were bred as lambs. The gains made by wether lambs produced by ewes bred as yearlings compared favorably with the gains of wethers from ewes bred as lambs, but the ewe lambs produced by mothers bred as lambs did not reach the same mature weight and they were less able to come in season as lambs. They also produced a less thrifty lamb crop than their mothers. It seems important, if the breeding of ewe lambs is practiced, that this be limited to those ewes produced by mature mothers.

Determination and inheritance of sex in animals, E. Witschi (*Bestimmung und Vererbung des Geschlechts bei Tieren. In Handbuch der Vererbungswissenschaft. Berlin: Borntraeger Bros., 1929, vol. 2–D, pp. [2]+115, figs. 95*).—Various theories of sex determination and factors influencing sex are discussed.

FIELD CROPS

[Field crops investigations in North Dakota, 1927–1929], H. L. Walster, H. L. Bolley, C. E. Mangels, T. H. Hopper, and A. F. Yeager (*North Dakota Sta. Bul. 233 (1930), pp. 5–17, 47–51, 53–55, 58–60, 83, figs. 7*).—The further progress (E. S. R., 59, p. 825) of agronomic experiments is reported on. Activities besides those noted below included fertilizer tests with wheat; breeding work with wheat, corn, and sweetclover; and tests of agricultural seed for identification, purity, and germination. The scope of the work at the Edgeley and Williston Substations (E. S. R., 61, p. 726) and the Hettinger and Langdon Substations (E. S. R., 62, p. 129) has been noted earlier.

Outstanding cereal varieties in comparative tests included Rainbow oats, a selection from Green Russian, apparently resistant to both the stem and crown rust of oats; Trebi barley; Ceres wheat; and Linota flax. Strains of Minnesota No. 13 and Northwestern Dent corn adapted locally matured earlier and yielded more grain than strains of these corns from Minnesota. The yield of Howes Alberta flint corn was materially increased by closer planting.

The relation of the comparative stage of maturity of corn to soil treatments and crop sequences was studied on Fargo clay from 1924 to 1929, inclusive. Corn matured earlier in each year and on all plats receiving stable manure with superphosphate than on plats receiving only stable manure. In four years stable manure significantly hastened maturity in six different rotations, and in two years in a fertilizer trial rotation of corn, wheat, clover, and oats. Clover residues, i. e., sod remaining after removal of two crops of hay, seemed to delay maturity as compared with timothy residues. Inconclusive data suggested that limestone applications slightly hastened maturity, whereas potassium sulfate retarded it somewhat. In effect on the maturity of corn, the rotation corn, barley, timothy, and wheat with stubble manured for corn was consistently in or near the lead. No decided relationship was apparent between yield and earliness, and the different rotations did not maintain their yield rank consistently from year to year.

Protein survey data (E. S. R., 60, p. 818) showing wheat to average 11.75 per cent of protein in 1927 and 12.12 in 1928 was confirmed closely by tests of more than 30,000 car lots by the Minnesota State Inspection Department which revealed averages of 11.7 per cent in 1927–28 and 12.15 in 1928–29. Crop survey data showed that the effect of preceding crops on the protein content of wheat will vary considerably in different areas of the State. In the heavy soil areas in eastern North Dakota wheat from alfalfa or sweetclover land usually averages higher in protein content, but varies considerably in other areas. In western North Dakota wheat after cultivated crops and particularly summer-fallow apparently tends to increase in protein content. J. C. Russell observed that weed infestation of land in the year before the wheat crop reduces the protein content of the wheat. He also noted that in the Golden Valley County area in 1928 wheat grown on north slopes averaged higher in protein content than wheat from south slopes, other conditions being equal.

A cool season was found to favor the production of a wheat crop with a high test weight per bushel. High temperatures, especially late in the growing season, affect test weight adversely—directly by hastening maturity and drying up the leaves before the grain is filled properly and indirectly in that a combination of moisture and high temperature provides conditions favorable for the development of black stem rust. It was evident that moderately high temperatures in a very dry season would not seriously injure the test weight, since black stem rust requires both heat and moisture for development. Variation of the pigmentation (yellow coloring matter in the endosperm), an important quality factor in durums, is reported as primarily a varietal factor, yet the same varieties have been observed to vary from season to season.

Studies on glutens and gluten proteins from different types of wheat have failed to date to show any significant difference in chemical composition. In preliminary work on the fatty materials and mineral salts associated with the gluten, it was found that durum glutens invariably contain more ash and phosphorus than common wheat glutens. The fatty material extracted from common and durum wheat gluten was found to vary in physical properties, iodine number, saponification number, and the percentage of unsaponifiable material. Common wheat contains in the unsaponifiable material a phytosterol which melts at 93° C. and is converted into normal sitosterol (m. p. 137°) by boiling from 6 to 8 hours with alcoholic potash. Durum wheat, however, contains only the normal sitosterol.

Analyses of seven barley varieties of the 1924, 1926, 1927, and 1928 crops showed the main differences to be in the variations in crude protein content. Varying with the season and the variety, the protein content averaged highest in 1926 and lowest in 1928, and Trebi uniformly had the lowest and Nepal, a naked barley, the highest. With the protein content varying from 8.51 to 14.65 per cent in hulled varieties and occurring as high as 15.02 per cent in Nepal, variation is evident in the feeding value of barleys. Nepal had only about one-half as much crude fiber as the other varieties. In 1928 all varieties were low in protein and high in ash, fiber, and nitrogen-free extract.

Studies of the flax stands on farms and at the station demonstrated that where 2 pk. per acre of a small-seeded flax, as NDR-114, is usually sown at least 3 pk. of a large-seeded variety, as Bison, should be planted. The thinner stands produced by equivalent quantities of large-seeded flax may explain in part the rather low yields of the large-seeded varieties in field tests.

Seed potatoes produced under different methods of planting, maturing, mulching, or shading differed decidedly in appearance, yet, when the seed was planted the next season, no consistent difference was apparent in the quantity and quality of the crop produced. Tests of many strains of Triumph, Cobbler, and Early Ohio potatoes indicated that wide differences exist between some of them, particularly among Triumph strains.

Alfalfa clipped on eight dates from May 25 to July 15, inclusive, for any date of clipping usually produced the most seed on beds of most recent planting. Older alfalfa plantings usually gave less seed than the younger plantings. In 1929 there was a general trend to an increase of seed production on all clippings until about July 6, while the highest average hay yield was made in the second crop after the early clippings.

Fertilizer trials on farms revealed many soils on which yields of alfalfa, corn, wheat, oats, and potatoes may be increased by application of superphosphate. Such areas have black, nearly flat, but well-drained loamy soils with friable yellow subsoils and produce low crop yields, except on spots where straw stacks have rotted or burned. Noteworthy increases were obtained on established stands of alfalfa top-dressed with superphosphate.

Solutions of sodium chlorate, potassium chlorate, and sodium arsenite killed high percentages of quack grass, and hoeing wet to puddle after July 28 and hoeing to keep black after July 28 (8 times) were also very effective. As much as 6 gal. of kerosene or crank-case oil per square rod was only of temporary value. Applied at the maximum rates of 4 lbs. in 4 gal. of water per square rod, concentrated sulfuric acid, nitric acid, acetic acid, and concentrated ammonium hydroxide did not give satisfactory results, nor did sal soda at nine times this rate. Study of the composition and food-reserve content of the roots of quack grass gave indications that by reburial of the roots and prevention of aboveground development the weed may be eradicated in one season. Flixweed (*Sophia sophia*), one of the recently introduced mustards, has become widely established but is found chiefly on waste land.

[Agronomic experiments at the Dickinson, N. Dak., Substation, 1927–1929], L. Moomaw (*North Dakota Sta. Bul. 233 (1930), pp. 124–127*).—Extensive tillage and rotation experiments in cooperation with the U. S. Department of Agriculture showed that the highest yields of all crops were made on summer-fallow. Small grains grown on disked corn ground yielded nearly 20 per cent less than on fallow. Plowing under green manures at their maximum growth in late June did not increase the yield of small grains when compared with yields on ordinary fallow, usually plowed two or three weeks earlier. Yields of all crops averaged slightly higher on spring-plowed than on fall-plowed land. On unplowed fallow cultivated only with the duckfoot cultivator, wheat during the period 1924–1928 made as good yields as on plowed fallow.

Tillage and previous crop did not affect the protein content of wheat enough to warrant any change in cropping practice solely with the aim of increasing protein content. Based on 20 years of yields and the protein content of 5 years, with average prices, the market returns per acre were in direct relation to acre yield, and for the main tillage methods were in decreasing order fallow, disked corn ground, green manure, spring plowing, and fall plowing. Although wheat with the highest percentage of protein was grown on green manured land, the lower yield made the return less than after either fallow or corn. Where wheat followed green manure crops, that after rye showed a higher protein content than the wheat grown after field peas and sweetclover. The type of season affected the protein content of the wheat more than any other factor.

For land infested with wild oats, french weed, and most other weeds common in the district the most practicable control method adapted to grain farming was found to be the use of duckfoot fallow. Early tillage appeared essential to cover the seeds so that rain in May and June will induce germination and result in the seedlings being killed by later cultivation.

Prominent among the cereal varieties were Ceres spring wheat, Kubanka (Selection No. 132) durum, Green Russian and Gopher oats, Prolific Spring and Dakold (winter) rye, Steigum and Odessa barley, Gehu (flint), Falconer (semident), and Payne and Pioneer (dent) corn, and Linota flax. In a smut nursery of wheats grown from bunt-inoculated seed the percentage of smutty heads ranged from a trace in Hope to 82 in Ulka No. 1 Early seeding when the ground was cold and moist produced more smut than later seeding with warm or drier soil.

Winter wheats protected in winter by standing cornstalks averaged in the two years about the same yield as Marquis spring wheat, but during a longer period yielded about 10 per cent less than Marquis and were produced at a considerable loss in the feeding value of the corn stover. Wheat, oats, and barley left standing for 4 weeks after ripening lost little in yield and test weight in the first week, but thereafter an increasing loss occurred in both qualities. Ceres lost slightly less than Marquis or Nodak durum, and oats lost more from shattering than did wheat or barley. The seeding of spring wheat, oats, and barley about April 15 usually resulted in higher yields than from later seeding. Grimm and Ladak led the alfalfas, and crested wheatgrass was outstanding for early pasture. The behavior of brome, slender wheatgrass, and crested wheatgrass in clipping experiments is noted on p. 824.

[Farm crops experiments at the Hettinger, N. Dak., Substation, 1929], C. H. Plath (*North Dakota Sta. Bul. 234 (1930), pp. 6–21*).—Variety tests with wheat, oats, barley, corn, flax, alfalfa, sweetclover, field peas, beans, and potatoes; cultural tests with corn, alfalfa, and sweetclover; a trial of superphosphate as a wheat fertilizer; and crop rotations are again (E. S. R., 62, p. 129) reported on.

Early-sown (April 24) barley, barley-oats mixture, wheat, and emmer for feed produced more grain and total digestible nutrients per acre than when late-sown (June 6), while the reverse was true for oats. The early-seeded barley and wheat made the highest yields of any of these grains. Corn yields increased on heavy soil as the listing depth decreased from 8 to 4 in. and vice versa on light soils, while on both soils surface planting was more productive than listing.

The stands obtained in fall seeding tests with sweetclover during 2 years favored drilling over broadcasting by 31 per cent, and the difference was more pronounced on fallow than on stubble. Practically no difference was noted between scarified and unscarified seed and only a slight advantage of the yellow- over the white-flowered type. Under average conditions a satisfactory stand of either yellow- or white-flowered sweetclover, scarified or unscarified, and either drilled shallow or broadcasted without covering in late fall or early winter would be expected by using good seed. Shallow drilling, however, apparently would produce better results than broadcasting without covering.

[Field crops work at the Williston, N. Dak., Substation, 1929–30], E. G. Schollander (*North Dakota Sta. Bul. 235 (1930), pp. 7–33, figs. 10*).—Continued agromonic experiments (E. S. R., 61, p. 726) reported on for the year ended March 31, 1930, embraced varietal trials with common spring and durum wheat, oats, corn, barley, flax, field peas, beans, alfalfa, sweetclover, and millet; trials of strains, comparison of home-grown and shipped-in seed, and improvement by the tuber unit method, all with Triumph potatoes; a study of losses caused by allowing cereals to stand uncut after ripe enough to harvest with the binder; and crop rotation and crop sequence studies. The results of analyses and baking tests of varieties of wheat of the 1927 and 1928 crops and the comparative yields of corn, wheat, oats, and barley for feeding purposes are also tabulated.

[Field crops work on the county experiment farms in Ohio, 1927] (*Ohio Sta., Co. Expt. Farms Rpts. 1927, Belmont Co. Farm, pp. 1–3; Clermont Co. Farm, pp. 1–3; Hamilton Co. Farm, pp. 1–3; Madison Co. Farm, p. 3; Mahoning Co. Farm, pp. 2–4; Miami Co. Farm, pp. 3, 4; Paulding Co. Farm, pp. 1–3; Trumbull Co. Farm, pp. 2–4; Washington Co. Farm, pp. 1–4*).—Agronomic experiments reported on for 1927 included variety tests with corn, wheat, oats, barley, soybeans, alfalfa, lespedeza, and miscellaneous legumes; comparisons of red clover seed from different sources and of mixtures for hay; cultural (including planting) tests with corn, lespedeza, and soybeans; cultural, liming, and pasture studies with sweetclover; methods of cleaning up cornfields in borer control; comparison of oats, wheat, and hay on drained and undrained land; spraying and dusting tests with potatoes; fertilizer trials with wheat and corn and crops in rotation; effect of legumes plowed under on crop yields; crop rotations; pasture studies; and weed-control experiments.

[Field crops work on the county experiment farms in Ohio, 1928] (*Ohio Sta., Co. Expt. Farms Rpts. 1928, Belmont Co. Farm, p. 2; Hamilton Co. Farm, pp. 1, 2; Madison Co. Farm, pp. 3, 4; Mahoning Co. Farm, pp. 1, 4; Miami Co. Farm, pp. 1, 2, 3; Paulding Co. Farm, pp. 3, 4; Washington Co. Farm, pp. 3, 4*).—Experiments with field crops reviewed for 1928 embraced cultural and fertilizer tests with corn; variety tests with wheat; comparisons of the feeding value of different cereals; cultural and liming tests with sweetclover; mulching, spraying, and dusting trials with potatoes; control studies with Canada thistles and quack grass; pasture experiments; and crop rotations.

[Field crops work on the county experiment farms in Ohio, 1929] (*Ohio Sta., Co. Expt. Farms Rpts. 1929, Belmont Co. Farm, pp. 1, 2; Clermont Co. Farm, pp. 1–4; Madison Co. Farm, pp. 2–4; Mahoning Co. Farm, pp. 3, 4; Miami Co. Farm, p. 4; Paulding Co. Farm, pp. 1–4; Trumbull Co. Farm, pp. 3, 4; Washington Co. Farm, pp. 1, 2, 3*).—Investigations with various field crops reported on for 1929 dealt with varieties of corn, wheat, oats, barley, soybeans, and lespedeza; sources of red-clover seed; the relative worth of mixtures for hay; and the feeding value of cereal crops. Other activities were cultural tests with hay crops, soybeans, lespedeza, and sweetclover; fertilizer trials with corn, wheat, and tobacco; control of Canada thistle with chlorates; effects of legumes on corn; crop rotations; and a pasture test involving the principles of the Hohenheim system.

Agronomy (*Agr. Prog. [Agr. Ed. Assoc., London], 6 (1929), pp. 45–77*).—Papers of agronomic interest in this group include Poor Heavy Land and Its Problems, by A. W. Oldershaw (pp. 45–47); Pit Silage, by R. Mackenzie (pp. 47–53); Early Potatoes, by W. B. Mercer and W. A. C. Carr (pp. 53–56); The Ryegrass Seed Industry of Northern Ireland, by S. P. Mercer (pp. 56–60); Experiments with Soya Beans in Shropshire, by D. H. Robinson (pp. 60–64); " Sprain "—of Potatoes, by S. Burr (pp. 64–66); The Control of the American Gooseberry Mildew in Northern Ireland, by A. E. Muskett and E. Turner (pp. 67, 68); Methods of Pasture Analysis, by R. A. Roberts (pp. 68–70); and Field Work on the Soils of Kent, by B. S. Furneaux (pp. 70–77).

Crop trials statistically treated in north Bihar, A. P. Cliff (*Agr. Jour. India, 25 (1930), No. 2, pp. 107–116*).—Yield data from fertilizer trials with sugarcane, corn, wheat, oats, barley, and rice, and variety tests with these crops, peas, gram, and flax are treated statistically.

The estimation of yield in cereal crops by sampling methods, A. R. Clapham (*Jour. Agr. Sci. [England], 19 (1929), No. 2, pp. 214–235, figs. 5*).—Random sampling of plats of wheat and barley at the Rothamsted Experimental Station was found to be superior in several ways to systematic methods of sampling. It appeared that by the use of a random sampling method the variance due to sampling errors may be made a satisfactorily small fraction of the total variance of 1/40-acre cereal plats.

Non-reciprocal cross-inoculation of legume nodule bacteria, O. H. Sears and F. M. Clark (*Soil Sci., 30 (1930), No. 3, pp. 237–242, fig. 1*).—Nodule organisms from none of six common legumes studied at the Illinois Experiment Station ordinarily produced nodules on Woods clover, while pure cultures of Woods clover nodule bacteria produced nodules upon garden and navy bean plants. It was observed that pure cultures of organisms isolated from the garden or navy bean infected Woods clover, provided the bean nodules resulted from infection by Woods clover nodule bacteria. Judged by nitrogen fixation, the bean cultures were more effective upon the bean plant than the Woods clover cultures, even though each culture produced abundant nodule development.

The chemical composition of some North Dakota pasture and hay grasses, T. H. Hopper and L. L. Nesbitt (*North Dakota Sta. Bul. 236 (1930), pp. 38, figs. 5*).—The influence of species, maturity, grazing, strain, climate, altitude, shade, and moisture content on the chemical composition of grass and grasslike plants is indicated from the results of analyses at the station and elsewhere, and the native vegetation of the prairies of North Dakota is described briefly. The composition of 29 species of grasses and grasslike plants collected at Fargo and Mandan are presented, with notes on the physical characteristics and general value of the several species.

Analyses of bromegrass, slender wheatgrass, and crested wheatgrass cut by L. Moomaw at different growth stages at Dickinson showed that the composition of early cuttings of these grasses was influenced somewhat by the aftermath from the previous season's growth and that of the late cuttings was influenced somewhat by the bottom growth which develops as the plant ripens its seeds. All three species reached the stage of highest nutritive value in May, when they attained their highest content of crude protein and lower content of crude fiber.

Frequent clipping, representing grazing, appeared to maintain a young succulent grass growth high in crude protein content and low in crude fiber content. In the grasses clipped frequently the ash content was generally higher. During the rainy part of the season, when rapid growth occurred accompanied by a high rate of respiration, there was a high accumulation of ash or mineral matter. The percentage of protein in the frequently clipped grasses averaged approximately twice that in the unclipped. The grass from the plats clipped frequently uniformly contained a lower crude fiber percentage content than that from the unclipped plats which had a uniformly higher percentage of nitrogen-free extract.

Strains of bromegrass differing markedly in chemical composition have been described earlier (E. S. R., 46, p. 330) by Waldron.

Pasture investigations on the short grass plains of Saskatchewan and Alberta, S. E. Clarke (*Sci. Agr., 10 (1930), No. 11, pp. 732–749, figs. 6*).—This preliminary report of the activities of the Dominion Range Experimental Station at Manyberries, Alta., gives the principal observations in a study of the botanical and chemical composition of the native vegetation (in 1927 and 1928) and in a study of the effects of different grazing practices upon the vegetative cover.

Hay and pasture crops, W. J. Squirrell (*Ontario Dept. Agr. Bul. 347 (1929), pp. 72, figs. 32*).—This is a revision of Bulletin 269 (E. S. R., 41, p. 334).

The lawn, L. S. Dickinson (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trubner & Co., 1930, pp. VIII+9–128, pls. 11, fig. 1*).—Practical information is given on preparation and management practices for turf in park, golfing, and home areas.

Hardy alfalfa, W. J. Squirrell (*Ontario Dept. Agr. Bul. 346 (1929), pp. 14, figs. 9*).—Practices essential to the successful growing of alfalfa in Ontario are described, largely from tests at the college and in cooperation with farmers. Experimental results suggested sowing from 15 to 20 lbs. of good seed per acre of suitable variety, as Ontario Variegated or Grimm, preferably before rather than behind the tubes of the grain drill. It was found that alfalfa seed could be sown to advantage alone on winter wheat or winter rye very early in the spring when the land has a fresh, light covering of snow; with a nurse crop, such as barley, spring wheat or rye, or even with oats if the latter is sown thinly; and as the only crop on a good fallow about July 15.

Hardy alfalfa varieties lead in field trials, H. C. Rather and G. F. Wenner (*Michigan Sta. Quart. Bul., 13 (1930), No. 1, pp. 19–22*).—Variegated types of alfalfa (E. S. R., 62, p. 426), as Hardigan and Grimm, continued to lead in overstate production tests.

Broomcorn growing and handling, J. H. Martin and R. S. Washburn (*U. S. Dept. Agr., Farmers' Bul. 1631 (1930), pp. II+37, figs. 24*).—Superseding Farmers' Bulletins 768 (E. S. R., 36, p. 229) and 958 (E. S. R., 39, p. 441), this describes the uses, production, adaptation, and varieties of broomcorn, outlines cultural, harvesting, and marketing practices, cites production costs and returns, and indicates diseases and insect pests of broomcorn and methods for their control.

Fertilizing helps the June clover crop, A. G. Weidemann (*Michigan Sta. Quart. Bul., 13 (1930), No. 1, pp. 3–8, figs. 5*).—Red clover spring sown in wheat in a 4-year rotation on Hillsdale sandy loam did not do well in the first year or persist into the second year, except where potash or manure had been supplied. In greenhouse tests with the same soil any fertilizer treatment, and even no fertilizer treatment, produced clover. The two cases differed in that the greenhouse clover was grown under controlled conditions of moisture and temperature, while that in the field was subjected to a long, severe summer drought and a long, hard winter. The difference between a yield of clover and no clover seemed to be governed largely by the quantity of available potash in the soil, and it appeared that the effect of potash lies largely in its ability to produce a hardy, resistant plant capable of withstanding the field hardships.

Archaeological evidence concerning the origin of sweet maize, G. W. Hendry (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 508–514, fig. 1*).—Examination of an ear, evidently sweet corn, from a prehistoric Peruvian tomb (between 1000 and 1534 A. D.) and other evidence led the author to conclude that sweet corn has been derived through mutation from an older endosperm type or types and that such mutation has occurred in at least one instance in the Peruvian highlands prior to 1534 A. D. Since only varieties of the floury and flint types are known to have existed there, or in neighboring regions, and since the specimen resembles the former in minor varietal characteristics, such as number of rows of kernels and kernel shape, it seems probable that in this instance the sweet mutant first appeared in a variety of the floury type. A distinct group of sweet varieties, possessing characteristics similar to the Huamachuco variety and possibly of similar genesis, is to be found under cultivation among the Indians of the arid Southwest, and probably in Peru.

Effects of superphosphates upon the germination of corn, C. O. Rost (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 498–507*).—The effects upon the germination of corn of quantities of 16 per cent superphosphate ranging from 360 to 5,760 lbs. per acre and of 46 per cent superphosphate ranging from 125 to 2,000 lbs. were studied at the Minnesota Experiment Station under field conditions on Hempstead silt loam, Merrimac loamy sand, and a high lime peat, and in the greenhouse on the Hempstead silt loam. In the field the fertilizers were applied with an attachment to the planter and also by mixing with the soil to a 3-in. depth on a rectangular area of 6 by 10 in. for each hill. The latter method was used in the greenhouse.

On 6- by 10-inch areas neither superphosphate harmed the germination of the corn when used at rates resembling those usual in farm practice, but when the rates were 10 to 20 times these quantities the germination was affected. The pot tests in the greenhouse showed that very heavy applications of either fertilizer retarded germination. With the larger quantities used the time required for plants to appear above the surface was the longer. Here, as in the field trials, large quantities of the 46 per cent superphosphate appeared more harmful than equivalent amounts of 16 per cent superphosphate. The pot tests indicated that heavy applications of both materials retard germination less when they have been in intimate contact with the soil for some weeks before planting. Applied with a fertilizer attachment neither 415 lbs. per acre of 46 per cent superphosphate nor 320 lbs. per acre of 16 per cent superphosphate harmed the germination of corn in 1928, but in 1929 a similar application of 350 lbs. per acre of the 46 per cent superphosphate seriously affected germination.

Ginning percentage and lint index of cotton in relation to the number of cotton fibres per seed—the effect of environment on ginning percentage and the determination of unit-fibre weight, A. J. Turner (*Jour. Textile Inst., 20 (1929), No. 9, pp. T233–T274, figs. 3*).—This contribution from the Indian Central Cotton Committee Technological Laboratory is largely concerned with the relative merits of ginning percentage and lint index as measures of the amount of lint borne on a single cottonseed. The work of H. M. Leake, W. L. Balls, and L. H. Burd along this line is reviewed critically. Data are tabulated from a wide range of material.

Variation in lint weight and seed weight evidently may be due to many different causes, viz, differences in the age and situation of seeds and bolls and in the variety and conditions of growth of plants. It is concluded that the lint index can not be measured only by the number of fibers per seed, and that from the number of variables appearing in the equation for ginning percentage no direct proportionality ought to be expected between the ginning percentage and the number of fibers per seed or any other single property, whether volume of seed or unit fiber weight.

It appeared advantageous to study the ginning percentage of individual seeds, and a number of such results are given for the Bengals cotton, Aligarh A. 19, and for Punjab-American 4F. These cottons also display association of high ginning percentage with low seed weight. The weight of lint per unit seed surface is practically the same on the average for the small, medium, and large 4F seeds but fluctuates considerably for individual bolls of A. 19. Neither the total number of fibers per seed nor the number per unit area of seed surface seemed directly proportional either to the seed weight or to the ginning percentage.

From an examination of the various possibilities in the development of lint on the seed it is concluded that if both the hereditary and environmental factors operating during the growth of the lint are considered the fiber weight per unit length may differ for different lengths of fiber. In general, a tendency may exist for the shorter fibers to have a rather greater fiber weight per unit length. Results given for certain Indian cottons show that some varieties display a greater fiber weight per unit length for their short fibers, and that in some cases the fiber weight of individual fibers decreases very considerably from the middle of the fiber to the apex. These results also hold for the fibers on an individual seed. The paper concludes with a description of a method for determining the average number of fibers of each group length per seed and summarizes the results so far published for the number of fibers per seed of different varieties of cotton.

Oat varieties highly resistant to crown rust, H. C. Murphy and T. R. Stanton (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 573, 574*).—Victoria (C. I. Nos. 2401 and 2764) oats and *Avena strigosa* var. *glabrescens* (C. I. No. 2630), in cooperative investigations between the U. S. Department of Agriculture and the Iowa and Kansas Experiment Stations, showed unusual resistance to crown rust (*Puccinia coronata avenae*) in 1929.

Potatoes, W. J. Squirrell, A. H. Maclennan, and J. A. Carroll (*Ontario Dept. Agr. Bul. 352 (1930), pp. 29, figs. 9*).—Practical information on the production of potatoes in Ontario is given, based on extensive experiments, varietal, cultural, and seed preparation and planting experiments, at the Ontario Agricultural College and in cooperation with farmers.

Sugarcane-sorghum hybrids, R. Thomas and T. S. Venkatraman (*Agr. Jour. India, 25 (1930), No. 2, p. 164*).—The sugarcane P. O. J. 2725 flowered about October 15, 1929, at Coimbatore, but without pollen of its own, and its stigmas were dusted with pollen of a sorghum known locally as Periamanjal.

The fuzz produced gave high germination with thousands of seedlings. Considerable variation was noted among the F_1 progeny. Certain plants exhibited sorghum characteristics in growth habit and in the shape, texture, and structure of leaves. The hybrids also included quite a number of albinos not noticed among sugarcane seedlings but not uncommon in sorghum seedlings.

Cuba, Haiti, and Louisiana as sugar countries [trans. title], G. Mikusch (*Ber. Landw. Reichsmin. Ernähr. u. Landw.* [*Germany*], *n. ser., Spec. No. 21* (*1930*), *pp. VIII+248, pls. 2, figs. 76*).—A comprehensive account of cultural, manufacturing, economic, and social factors involved in sugar production in Cuba, Haiti, the Dominican Republic, and Louisiana is presented from an extensive survey in 1928 and 1929.

The influence of spacing on the yields of cane and sugar per hectare under Luzon conditions, M. L. Roxas and N. D. Grecia (*Sugar News, 10* (*1929*), *No. 11, pp. 826–851, figs. 10*).—A new method of planting sugarcane was compared with the usual method at the stations at Canlubang and Del Carmen in Luzon. The new method consisted in planting the same number of cuttings as in the ordinary method, but arranging them in hills of double cuttings twice as far apart in the furrows as in the single cutting planting and receiving per hill double the quantity of fertilizer. In all experiments the double-set planting gave substantial increases in yield over the single cutting, both in cane and in sugar per hectare, i. e., the double-set method gave from 10 to 37 per cent more cane and from 14 to 44 per cent more piculs of sugar per hectare than the ordinary method. At harvest the number of standing hills in the double planting varied from 66 to 88 per cent of that set in the field, as against 50 to 60 per cent of the number of hills set for the ordinary planting. While the numbers of stalks per hectare produced by the two methods were practically the same, the weights per stalk were from 5 to 37 per cent greater in the double than in the single planting.

The use of a lime-magnesium solution for soaking cane points, M. L. Roxas and N. D. Grecia (*Sugar News, 10* (*1929*), *No. 11, pp. 815–820, figs. 2*).—Treatment of sugarcane cuttings with a lime-magnesium solution according to the method of May (E. S. R., 57, p. 529) was found greatly to increase the yields of cane and sugar. Cuttings treated with this solution and planted immediately after soaking them for 24 hours gave 62 piculs of sugar per hectare (3,513 lbs. per acre) more than those soaked in water alone. Allowing the soaked cuttings, whether in water or in lime-magnesium solution, to stand for 4 days in a moist condition before planting was detrimental to germination and to the yields of cane and sugar. The cost of the lime-magnesium treatment was less than $1.50 per hectare.

The principal varieties of wheat grown in Morocco, E. Miège (*Les Principales Variétés de Blés Cultivées au Maroc.* [*Rabat, Morocco*]: *Dir. Gén. Agr., Com. et Colon. Serv. Agr., 1930, pp. 38, pls. 10, figs. 5*).—About 860,000 hectares (2,125,060 acres) of hard wheat and 220,000 hectares of soft wheat are grown in Morocco. Eight important hard (*Triticum durum*) and 10 of the soft (*T. vulgare*) varieties grown in the region are described and illustrated.

Methods of applying fertilizers to wheat, F. L. Duley (*Jour. Amer. Soc. Agron., 22* (*1930*), *No. 6, pp. 515–521, figs. 2*).—The merits of broadcasting fertilizer for wheat was compared with drilling in the row at the Kansas Experiment Station from 1926 to 1929, inclusive. The fertilizers were all applied at the rate of 175 lbs. per acre.

The average acre return from no treatment was 21.63 bu., from superphosphate broadcast 30.66 bu., and superphosphate in the row with the seed 37.06 bu. On this soil superphosphate showed slightly greater increases than 2–12–2 fertilizer when used at the same rate. The fertilizer in the row with the seed gave slightly higher yields than that applied either above or below the seed. Under the test conditions the use of fertilizer in the row with wheat appeared decidedly superior to broadcasting on yields of both grain and straw.

Killing field weeds with chlorates, C. J. WILLARD (*Ohio Sta. Bimo. Bul. 146 (1930), pp. 158–168*).—Recently available information is presented on where, how, at what rates, and when to use chlorates in weed control (E. S. R., 62, p. 634) and on other conditions affecting spraying, with special directions for dealing with Canada thistle, quack grass, poison ivy, hedge bindweed (*Convolvulus sepium*), ironweed, white snakeroot, and oxeye daisy. The effects of sodium chlorate on the soil, orchard trees, and livestock are described, and the usual precautions to be observed in handling the material are outlined.

The spotting method of weed eradication, E. P. DEATRICK (*Science, 71 (1930), No. 1845, pp. 487, 488*).—The use of a fertilizer, as ammonium sulfate, instead of a toxic salt to plasmolyze weeds, as reported by Grimmett (E. S. R., 62, p. 431), killed plantain and dandelion in a bluegrass lawn at the West Virginia University, and the grass bordering the treated zone was accelerated so greatly in growth that the bare spot was soon covered.

Puncture vine, a new pest in Idaho, H. L. SPENCE, JR. (*Idaho Sta. Circ. 60 (1930), pp. 4, fig. 1*).—The weed, puncture vine (*Tribulus terrestris*), is described, and control methods are outlined.

HORTICULTURE

[Horticultural investigations at the North Dakota Station], A. F. YEAGER (*North Dakota Sta. Bul. 233 (1930), pp. 80–83, fig. 1*).—Sweet corn breeding was continued (E. S. R., 59, p. 832) with the development of a new variety, Golden Gem, that ripens one week earlier than Sunshine. Two tomatoes, Viking and Fargo, possessing a determinate type of growth were introduced, and favorable reports were secured from the Agassiz tomato sent out for trial. Squash breeding work is briefly noted. Comments are made on various tree and small fruits and ornamental plants under test.

[Horticulture at the Williston Substation], E. G. SCHOLLANDER (*North Dakota Sta. Bul. 235 (1930), pp. 35–37, figs. 2*).—Brief notes are presented on the results of varietal tests with fruits and vegetables.

[Horticultural investigations, 1927] (*Ohio Sta., Co. Expt. Farms Rpts. 1927, Belmont Co. Farm, pp. 3, 4; Mahoning Co. Farm, pp. 1, 2*).—At the Belmont County Farm sulfur-lime dust treatment gave 90 per cent of scab-free Rome apples, as compared with 98.8 per cent of infected fruit on control trees. Adding arsenate of lead to the sulfur-lime dust gave excellent control of curculio on Jonathan apples.

Of sweet corns tested at the Mahoning County Farm Whipple Early Yellow was very promising and Howling Mob quite satisfactory. Golden Acre proved to be an excellent early cabbage. For fertilizing cabbage in the absence of manure, a complete mixture (5–12–4 (N–P–K)), was most profitable. Mulching of tomatoes delayed maturity and tended to increase frost injury. Staking gave lesser yields of tomatoes but much more attractive fruit. A combination of manure and superphosphate gave the highest yields of tomatoes, but in the absence of manure complete fertilizer proved best.

[Horticultural investigations, 1928] (*Ohio Sta., Co. Expt. Farms Rpts. 1928, Clermont Co. Farm, pp. 1, 2; Hamilton Co. Farm, pp. 3, 4; Mahoning Co. Farm, pp. 1–3; Washington Co. Farm, pp. 1–3*).—Applications of nitrogen so greatly increased growth of apple trees at the Clermont County Farm that at 17 years removal of fillers was necessary. Yields were materially increased by the use of nitrogen either after nitrate of soda or ammonium sulfate. A comparison between grass sod and tillage cover crops showed over a 7-year period that sod gave slightly heavier yields and larger profits.

Comparing at the Hamilton County Farm (1) ordinary cultivation, (2) cultivation once or twice followed by straw mulch, and (3) staking and pruning, it was found that staking yielded the earliest ripe tomatoes and cultivation the largest tomatoes. Mulching delayed maturity.

At the Mahoning County Farm ordinary glass proved superior to substitutes in hastening germination and in the subsequent growth rate of vegetable plants. As contributions to the production of high-grade fruit spring applications of nitrogen, light dormant pruning, and careful thinning of the fruit proved advantageous.

Observations are presented on the behavior of various apple varieties at the Washington County Farm.

[Horticultural investigations, 1929] (*Ohio Sta., Co. Expt. Farms Rpts. 1929, Belmont Co. Farm, pp. 2–4; Mahoning Co. Farm, pp. 1–3; Washington Co. Farm, p. 4*).—Results of spraying and dusting tests at the Belmont County Farm are presented in tabular form and show good success with both dusts and sprays.

Among promising fruits at the Mahoning County Farm was the Cortland apple. Sod culture plus nitrate successfully brought a young apple orchard into fruiting, giving larger trees and earlier fruiting than did tillage. Glass proved better than substitutes for starting vegetables, particularly cabbage. Paper-mulch culture of tomatoes yielded more ripe fruit than did staking or cultivation and was generally favorable with other vegetable crops.

In top-working operations at the Washington County Farm the covering of the entire wound and scion with melted wax gave better results than the usual method of waxing. Comparisons showed dusts to be quite as effective as sprays in controlling apple scab where the work was well done. Fineness of particles was a factor in the success of dusts. A combination program of spraying before bloom and dusting after bloom gave better results than dusting alone.

The essential nature of boron to the growth and fruiting of the tomato, E. S. Johnston and P. L. Fisher (*Plant Physiol., 5 (1930), No. 3, pp. 387–392, figs. 3*).—Following an earlier paper (E. S. R., 61, p. 524) by the senior author and Dore, further evidence is presented that a constant supply of boron is necessary for normal growth and fruiting in the tomato. Marglobe tomatoes grown in boron-supplied cultures developed normally and set approximately four times as many fruits as did boron-deficient plants. Within two weeks following placement in boron-deficient cultures tomato plants began to fall off in stem length increment, and soon the tops turned yellow and died. Fruits of the boron-deficient plants often developed a dry rot comparable to blossom end rot, except that it was not confined to the apex. Boron is considered to be fixed in the plant tissue and not translocated as needed, and appears to function as a simple nutrient required in extremely minute quantities.

[Physiological studies with fruits and vegetables] (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1928, pp. 31–33, 39–41, 53–56, 78–96, figs. 8*).—Investigations reported on in these pages are noted below.

The respiration (production of carbon dioxide) of pears in air and other mixtures of oxygen and nitrogen at 1° C., F. Kidd and C. West (pp. 31, 32).—Determinations of the rate of carbon-dioxide production in Conference pears stored at 1° showed that in the presence of only 1 to 2 per cent of oxygen the rate of carbon-dioxide evolution was depressed to approximately half that in air, at 5 per cent of oxygen the rate of carbon-dioxide output was only slightly depressed, and at 100 per cent oxygen the rate was practically the same as in air. In an atmosphere containing from 1 to 2 per cent of oxygen the pears maintained a steady rate of metabolism for many months at 1°. The balance of carbohydrate metabolism was different in air than in nitrogen, there being required about 40 days for readjustment upon the transfer of pears from air to nitrogen or vice versa. Pears with the highest pitch of respiratory activity had the shortest storage life.

Individual variation (apples), F. Kidd, C. West, M. Onslow, and M. N. Kidd (p. 32).—Observations on 120 individual apples constituting a sample taken from 10 trees suggested that the onset of fungal disease in any one fruit is not primarily determined by its percentage content of cane sugar or acid at the time of the onset, and that there is a positive correlation between the percentage content of nitrogen and the respiratory activity of individual fruits.

The carbon dioxide/oxygen ratio in the gaseous exchange of the apple at different stages in its life cycle, F. Kidd (p. 33).—Observations on the carbon dioxide-oxygen ratio of apples stored at 22.5° C. (72.5° F.) indicated that the change from values less than unity to values greater than unity occurs during the rise in respiratory activity associated with the period of the climacteric.

Cold storage of vegetables, J. Barker (pp. 39–41).—Records taken on the comparative life of vegetables stored at 33 and 45° F. showed generally much longer life at the lower temperature. Tests of 2 and 14° as holding temperatures for cabbage, cauliflower, Brussels sprouts, peas, and beans gave unsatisfactory results, the product becoming unpalatable upon thawing. On the other hand, 26 and 29° gave good results with most vegetables, excepting tomatoes, cucumbers, and lettuce. A temperature of 33° was injurious to tomatoes.

The generation of heat by respiring fruit, A. J. M. Smith (pp. 53–56).—With the aid of a microcalorimetric apparatus, the structure and operation of which is discussed in detail, it was determined that the rate of generation of heat by a single apple held at cold-storage temperature is of the order of 1 to 2 gram-calories per hour.

Chemical work on fruit, D. Haynes and H. K. Archbold (pp. 78–96).—Comparing the results of sugar determinations upon apple juice and upon the alcoholic extract of the tissue, the authors found that estimates of sugar of the juice tended to be slightly higher than those of the extract. It is believed that the juice contains a small quantity of an aldehydic substance which is converted into acid during the preparation of the alcoholic extract. Concerning the rate of loss of respirable material per unit of protoplasm, the conclusion is reached that the rate of loss is a varietal characteristic.

Using the varieties Bramley Seedling (very acid) and Worcester Pearmain (very mild) and storing the fruit at 1 and 12° C., the changes in dry weight, total sugar, reducing sugars, sucrose, residue, and acid were determined, the results being graphically presented. The curve for sucrose is considered remarkable because of its large curvature and accurately exponential form. The suggestion is made that the process of inversion is one of the factors regulating the rate at which the constituents of the apple are respired.

The belief is expressed as a result of a study of the changes in various apple constituents at 1 and 12° that internal breakdown in cold storage is probably connected with a change in the material available for respiration, the products of the inversion of sucrose being gradually replaced by the stable reducing sugars stored in the vacuole. The period of senescence in ordinary storage is believed closely analogous to the period of internal breakdown in cold storage.

Although the rate of respiration was reduced to a minimum with the cessation of inversion, death of the apple did not occur until the acid was greatly diminished, suggesting the importance of acid in apple metabolism. Acid was evidently produced throughout the storage life by the oxidation of the products of the inversion of sucrose, especially from active fructose. Acid is believed to function as a catalyzer for the process of respiration.

Comparing the behavior of early-picked and late-picked Bramley Seedling apples, there was noted a more rapid rate of respiration and a more rapid inversion of sucrose in the early-picked fruits. The rapid respiration of the early fruit is believed a natural attribute of the younger tissues.

The relation of low nitrogen content to good keeping is thought associated with the fact that the rate of consumption of sugar is proportional to nitrogen content. The desirability of modifying cultural practices to diminish nitrogen and increase sucrose is suggested. High nitrogen is apparently associated with the underdevelopment of the fruit.

Finding that pH of apple juice was very largely determined by the amount of salt and acid in the fruit, the pH reading was utilized with some success as a means of estimating the salt content of the juice. As established by J. W. Brown, the percentage of potash in the apple is correlated with the percentage of potash in the soil where grown, and similar relationships were apparent also in phosphate, magnesia, and lime. Good keeping quality is associated with a high percentage of available potash and phosphate in the soil and in the fruit.

The vegetative propagation of fruit-tree rootstocks, R. C. KNIGHT, J. AMOS, R. G. HATTON, and A. W. WITT (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 11–30, pls. 4*).—For the greater part this is a discussion of different methods of propagation—stools, layers, root cuttings, and stem cuttings—commonly employed in the asexual reproduction of fruit plants. Certain data are included on the results of trials with various varieties of fruits.

The root systems of some ten year old apple trees on two different root stocks, and their relation to tree performance, W. S. ROGERS and M. C. VYVYAN (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15, (1926–1927), pt. 2, pp. 31–43, pls. 8*).—By careful excavation at the East Malling Research Station of six Lane Prince Albert apple trees growing on Malling No. I (vigorous) and Malling No. IX (dwarf) roots, data were obtained on the nature and distribution of the root systems and their relation to top growth and production. None of the trees had a taproot. The root systems of the trees on the vigorous stock were from two to three times as heavy as those of the dwarf stock and were more widely distributed, but did not penetrate as deeply. The ratio of stem to root was practically the same in both stocks. The fresh weight of apples produced in the lifetime of the trees was in all cases greater than the total green weight of the stem and root.

The influence of rootstocks on the blossoming of seedling apples, H. M. TYDEMAN (*East Malling [Kent] Reesarch Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 51–55*).—Observations at the East Malling Research Station on the behavior of seedling apples worked on rootstocks differing widely in their known effect on scions showed a significant influence of the rootstock upon the initiation of blooming. One-half of the trees on dwarfing stocks bloomed in their sixth year as compared with less than 9 per cent of the same seedlings worked on a vigorous stock. At the same time only one of the seedlings on their original roots had blossomed.

The Northern Spy apple as a rootstock, R. G. HATTON (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 44–50, pl. 1*).—Possessing unusual resistance to woolly aphis, Northern Spy apple has been widely used as a rootstock for less resistant varieties without regard to its effect on the scion. In observations at the East Malling Research Station on Grenadier apple trees grown on Northern Spy and several of the station's asexual stocks evidence was secured that Northern Spy under the conditions of the test was distinctly a dwarfing stock, even more so than Malling No. II of known dwarfing tendencies. However, six-year-old bush Grenadier trees on Northern Spy produced less fruit than did those on Malling No. II.

A note on the orientation of main branches and its relation to stock in some "double-stock" apple trees, R. C. Knight (*East Malling* [*Kent*] *Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 56–59, pls. 2*).—Studying excavated Lane Prince Albert trees so constituted that a single scion was supported by two different stocks, the author found at the East Malling Research Station that in every combination the greater weight of branches occurred on that side of the trunk over the more vigorous of the stocks. The differences were, however, less than those recorded between Lane Prince Albert trees worked singly on the same stocks, and suggest that there was no complete isolation between the two sides of the tree. The position of the topmost branch, which generally produced the most growth of any, is conceded to be an important factor in determining the distribution of the total branch weight. In 22 of 23 cases the side which included the topmost branch also contained the greatest branch weight. No correlation was established between the position of the graft in reference to the rootstock and the distribution and growth of the branches.

Composition and fruit bud formation in non-bearing spurs of the Baldwin apple, G. F. Potter and T. G. Phillips (*New Hampshire Sta. Tech. Bul. 42 (1930), pp. 43, figs. 8*).—Working with new growth of nonbearing spurs collected in July and August, 1925, from mature Baldwin trees included in a diverse cultural and fertilizer experiment, the authors found that insoluble nitrogen was the spur constituent most consistently associated with fruit bud formation. Conditions which favored the accumulation of insoluble nitrogen determined in a large measure fruit bud formation. Some indication was observed that an accumulation of soluble carbohydrates, such as reducing sugars, depressed fruit bud formation. The accumulation of carbohydrates, such as starch, prior to July or in the July-August period was not an indication of favorable blossom bud differentiation conditions; in fact, differentiation in those trees in which there was an accumulation of these carbohydrates was actually though not significantly lower. Concerning the bearing of the carbohydrate-nitrogen ratio on the problem, the authors found a constant negative relation between carbohydrate-nitrogen ratio and fruit bud formation. The carbohydrate-nitrogen ratio showed, however, as close relation to fruit bud formation in most cases as did nitrogen, but was not significantly closer.

Some effects of defloration on fruit spur composition and fruit bud formation in the Oldenburg apple, G. F. Potter, H. R. Kraybill, S. W. Wentworth, J. T. Sullivan, and P. T. Blood (*New Hampshire Sta. Tech. Bul. 41 (1930), pp. 27, figs. 16*).—Analyses at repeated intervals of spur samples taken from Oldenburg apple trees carrying almost a full crop of fruit buds and treated as follows, (1) completely deflorated in the pink stage, (2) half deflorated, and (3) no treatment, failed to yield any critical evidence concerning the fundamental nutritional causes underlying fruit bud formation. The completely deflorated trees set an average of 41.4 per cent of flower buds, the untreated trees 9.2 per cent, and the 50 per cent deflorated trees 10.3 per cent. Data taken on the weight of the developing fruits showed the usual logarithmic curve of growth, the rate of increase reaching a maximum in the second and third weeks of July, when each apple absorbed about 1 mg. of nitrogen and 300 mg. of carbohydrates daily. The leaf area of completely deflorated spurs was considerably larger than that of the partly deflorated spurs and the controls.

In June and July the nitrogen content of bearing spurs was much higher than that of the other two groups and was considerably higher in percentage than the fruit. Beginning in July the concentration of nitrogen was almost identical in the two deflorated sets. The starch content of bearing spurs and of adjacent deflorated spurs on the partly deflorated trees was similar and consistently lower than that of spurs in the fully deflorated trees. The starch-sugar equilibrium of the fruit was independent of its spur, and sugar reached a much higher concentration in the fruit. The ash content of bearing spurs was comparatively low. No measurable differences between the three types of spurs were noted in respect to free-reducing substances, sucrose, phosphorus, phlorhizin, acid hydrolyzable substances, and total carbohydrates.

Apple thinning experiments, cause relations of small apples, size increases of large and small apples, quarter century study of a variety orchard, M. B. Cummings, E. W. Jenkins, and R. G. Dunning (*Vermont Sta. Bul. 308 (1930), pp. 60, pls. 8, figs. 3*).—In again presenting (E. S. R., 56, p. 442) a summary of investigational work with apples, special stress is placed on thinning and the underlying principles. Measurements of apple fruits made at repeated intervals throughout the growing season showed that on any one tree the smaller apples grew faster than the larger apples in terms of percentage increase but that the larger apples actually grew more. The small fruits were still small at harvest time and should have been removed early. Definite correlations were established between fruit size and number of seeds, indicating that size is due in part at least to the quality and quantity of fertilization. A close association was also recorded between leaf area per apple and size.

Detailed records taken upon the dropped and harvested fruits revealed the causes of injury, scab, codling moth, curculio, aphis, limb rub, stippen, and spray being the principal causes.

Concerning varietal studies, records show that over the 25 years of the orchard's life Red Astrachan, Yellow Transparent, Fameuse, and McIntosh were the most productive varieties. Among erratic bearers Baldwin and Yellow Transparent were conspicuous. Vagaries in bearing are presumed to be genetic rather than due to environmental causes. Wealthy on dwarf and on standard roots yielded much the same during the last 5 years of the study.

Storage improves water core apples, R. E. Marshall (*Michigan Sta. Quart. Bul., 13 (1930), No. 1, pp. 22–25, figs. 4*).—Delicious apples showing 90 per cent and Wagener apples from 50 to 75 per cent of water core in late October were stored at 32° F. until January 15 and then examined, with the observation that the water core had entirely disappeared from the Delicious and almost so from the Wagener apples. Another lot of Delicious with almost every fruit affected in October was nearly free on January 15 and entirely free on March 1, the data leading to the conclusion that moderate water core in these two varieties may be expected to disappear, to a merchantable extent at least, in cold storage.

The pear in Ontario, D. A. Kimball and G. H. Dickson (*Ontario Dept. Agr. Bul. 354 (1930), pp. 39, figs. 16*).—This comprises general information.

A progress report on winter pruning experiments with pear trees, J. Amos (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 65–71, pls. 3*).—Supplementing an earlier report on apples by Grubb (E. S. R., 48, p. 638), data are herein presented on the results of pruning trials with pears which in general show the same physiological responses. Blossom bud formation in the early years was reduced by pruning, and in the same order absence of pruning tended to result in early fruit production and incidentally greater growth as determined by trunk measurements. Pear trees because of their naturally pyramidal form lend themselves admirably to the modified leader type. The total length of new growth was greater in tipped trees in the first and third seasons after the treatment than in unpruned trees and about equal in the second season. Hard spurring of laterals resulted in the majority of cases in the production of potential blossom buds.

Pruning studies with the Cumberland black raspberry, J. S. Shoemaker (*Ohio Sta. Bimo. Bul. 146 (1930), pp. 156–158, fig. 1*).—Comparing the yields of raspberry plants with laterals headed back to 8 to 12 and 6 to 8 in., it was found that the lighter pruning resulted in the heavier yields. The more severely pruned plants, however, yielded more fruit in the last three pickings and size of berry was somewhat better maintained.

Colouring of oranges with ethylene, A. A. Ramsay and L. A. Musso (*Agr. Gaz. N. S. Wales, 41 (1930), No. 5, pp. 382, 383*).—Analyses of the juice of ethylene-ripened and untreated second crop oranges of the Parramatta variety showed no increase in total sugar content due to treatment, but there was an apparent conversion of cane sugar to fruit sugar. There was no conversion of sugar to acid.

Preliminary experiments in self- and inter-fertility of Pistacia, G. Savastano (*Internatl. Cong. Plant Sci., Ithaca, N. Y., Proc., 1926, vol. 1, pp. 815 820*).—Studies at the Agricultural and Horticultural Experiment Station, Acireale, Italy, showed 67 per cent pollen germination in *P. terebinthus*, 36 per cent in *P. vera*, and from 27 to 52 per cent in *P. hybrida*. Pollen lived from 15 to 20 days in the laboratory but only a few hours when exposed to direct insolation out of doors. Spraying plants with water to simulate rain completely inhibited pollination. In controlled pollinations the author established that *P. vera* pollen is decisively best for *P. vera* flowers. *P. hybrida* pollen had greater affinity for its own flowers than for those of *P. vera* or *P. terebinthus*.

An examination of pistachio nuts from healthy trees known to be near efficient pollinizers showed a wide range of empty nuts—10 to 53 per cent in *P. vera*, 46 to 54 per cent in *P. hybrida*, and 29 to 67 per cent in *P. terebinthus*. Inclosed flowers of *P. vera* set absolutely no nuts. Cultivated varieties of pistachios were found protandrous, a fact thouhgt to cause much pollination trouble. Failing to obtain full sets with hand pollination, the author concludes that some ovule abortion occurs after fecundation.

The vegetative propagation of walnuts, A. W. Witt (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 60–64, pl. 1*).—At the East Malling Research Station budding and grafting of Persian and black walnuts in the open was not found practical, apparently because of the rather violent climatic changes usually following the grafting season and which apparently prevented the perfect development of the union. Fine success was obtained in the greenhouse with both hardwood and softwood grafts, and considerable success was secured in asexual propagation by using softwood cuttings.

The American rose annual, edited by J. H. McFarland and G. A. Stevens (*Harrisburg, Pa.: Amer. Rose Soc., 1930, pp. 232, pls. 21*).—Included among papers of general interest are the following dealing with the results of research: Rose Understocks in Tennessee (pp. 72–74), by J. A. McClintock; Rose-Disease Investigations (pp. 75–79), by L. M. Massey and L. J. Meyer; Black-Spot and Brown-Canker Control (pp. 83–86) and An Infectious Chlorosis of Rose (pp. 87–90), both by R. P. White.

FORESTRY

Studies in tolerance of New England forest trees.—X, The change in the environmental factors caused by thinnings in pine plantations, W. R. Adams, jr. (*Vermont Sta. Bul. 310 (1930), pp. 40, pls. 8, figs. 14*).—As a further contribution to the general study (E. S. R., 62, p. 232) measurements were made of temperature and moisture conditions of the air and soil in thinned and unthinned stands of white and Scotch pines established in 1912.

The air temperature in the crowns of the trees fluctuated more in the thinned than unthinned areas. Higher day temperatures recorded on clear days on a level white-pine site with westerly exposure are attributed to the radiation of heat from the forest floor. In Scotch pine on a southerly exposure and a 20° slope air temperatures in the denser crowns were higher during the day in the unthinned stands. Nocturnal minimums were lower in the thinned than unthinned plats. During stormy weather the denser crowns were warmer than the more open ones.

Relative humidity fluctuated more in the open than in the dense stands, being lower in the day and higher at night. Atmometer readings did not always check with temperature and humidity records. A moderation of air temperature aboveground was observed in the white-pine stands in midsummer, but later the fluctuations were greater in the unthinned stands. Soil temperatures were not uniformly influenced by thinning but depended on the site. Daily changes in the air temperature did not greatly influence soil temperature, but prolonged periods of high or low air temperature were followed by slow changes which are believed to confuse the value of aboveground readings. Soil moisture was highly variable. Thinning increased the soil moisture content late in the season in the first foot of soil in the white-pine stand but lowered soil moisture in the Scotch-pine stands at 1-, 2-, and 3-ft. depths.

Growing trees for forest planting in Montana and Idaho, D. S. Olson (*U. S. Dept. Agr. Circ. 120 (1930), pp. 92, figs. 47*).—A general discussion of planting practices and methods, including a description of the necessary equipment, choice of soils, seeding, transplanting, various causes of injury, costs, etc.

Slash pine for reforestation in the Coastal Plain, W. R. Mattoon (*South Carolina Sta. Circ. 41 (1930), pp. 15, figs. 10*).—General information is given on the collection of seed, methods of planting seed and seedlings, rates of growth, forest products, and possible returns.

Second-growth white pine in Wisconsin: Its growth, yield, and commercial possibilities, S. R. Gevorkiantz and R. Zon (*Wisconsin Sta. Research Bul. 98 (1930), pp. 41, figs. 13*).—Studies in pure, even aged, fully stocked stands of white pine scattered throughout the northern part of Wisconsin indicated that white pine on average sites will produce 10,500, 36,500, and 59,000 bd. ft. per acre at the ages of 40, 60, and 80 years, respectively. On poor sites white pine yields at 40 years of age are estimated at 2,400 bd. ft. and on the best sites 19,000 bd. ft. No other conifer produces as large yields per acre and at the same time maintains as rapid growth until old age. There were only about 2,200 acres of planted white pine in Wisconsin at the end of 1929, although it is estimated that there are at least 2,000 square miles suitable for pine planting. Blister rust and weevil are not considered insurmountable obstacles to success of large plantings. On land costing not over $12 to $13 per acre reasonable profits should accrue. Appended are detailed yield tables, data on selection of the plats, determination of site indexes, the application of normal yield tables to understocked stands, stand tables, etc.

Natural reproduction of western yellow pine, W. J. Sproat (*Jour. Forestry, 28 (1930), No. 3, pp. 334–337*).—Observations following logging in the Crater National Forest showed only about 1 per cent of the total area cut over to have subsequent reproduction. Seedlings apparently required some protection of reserved trees, suggesting the advisability of partial cuttings. A large percentage of the seedlings and saplings present at the time of logging died later from exposure. Squaw carpet aided in protecting seed from rodents and birds and had a favorable effect on temperature and light conditions.

The frost hardiness of geographic strains of Norway pine, C. G. Bates (*Jour. Forestry, 28 (1930), No. 3, pp. 327–333*).—Norway pine seedlings taken from 31 lots grown from seed obtained from different points in the growing range of this species and submitted after hardening for 1 week at 36° F. to 10.4° for 24 hours were all killed. A second experiment in which a freezing temperature of 17.6° was employed was also generally disastrous. At 20°, preceded by from 7 to 10 days at 32° and followed by 2 days at 32° before return to the warm room, desirable results were obtained. The northern-grown lots survived much better than those from the warmer portion of the range, although there were some unexplainable variations. Apparently Norway pines from the northern limits possessed the power of hardening their seedlings rapidly.

The cultivation of exotic conifers in South Africa, C. E. Legat (*Empire Forestry Jour.* [*London*], *9 (1930), No. 1, pp. 32–63, pls. 2*).—The results of experiences with a large number of species assembled from various parts of the world are presented. Among the conifers *Pinus pinaster* and *P. insignis* are described as of first and second importance among the exotic conifers of South Africa.

Handbook of the science of caoutchouc, edited by K. Memmler (*Handbuch der Kautschukwissenschaft. Leipzig: S. Hirzel, 1930, pp. XXIV+766, pls. 10, figs.* [*207*]).—Following a more or less detailed introduction the book contains seven sections by various authors, as follows: (1) The botany, collection, culture, and preparation of caoutchouc; (2) the chemistry of caoutchouc; (3) the vulcanization problem; (4) chemical-analytical testing methods; (5) the physics of caoutchouc; (6) mechanical-technological testing methods; and (7) the microscopy of technical vulcanized products.

Sinkage studies, I, II (*Canad. Jour. Research, 2 (1930), No. 6, pp. 409–424, figs. 8; 425–439, figs. 11*).—A report upon the results of studies conducted at McGill University.

I. *The mode of penetration of water into logs: Preliminary field experiments,* G. W. Scarth and E. C. Jahn.—"The distribution of water in logs floated in a lake was determined and found similar to that in living trees. The trees examined belonged to the following species—jack pine, spruce, poplar, and balsam—in which there is a relatively dry heartwood becoming wetter in the order named, the sapwood being wet all around, and birch in which the heartwood is equally as wet as the sapwood.

"The rate of radial penetration of water into the logs seems to increase in the order birch, jack spine, spruce, balsam, poplar. Penetration takes place very slowly, even into sapwood. The advantage of a large proportion of relatively dry heartwood depends more on the initial buoyancy it confers than on the greater resistance to penetration it may possess. Narrow outer rays and density of the wood diminish the rate of penetration in the samples studied. In air-dry logs penetration of free water is also very slow; saturation of the cell walls precedes it at a more rapid rate. The gas in floated logs is enveloped by water and can escape only in solution. There is evidence that more gas may be liberated by fermentation of storage material in the parenchyma cells. Whether escape of gas or penetration of water is the leading factor in determining rate of sinkage is undecided at present."

II. *The seasonal distribution of water and gas in trees,* R. D. Gibbs.—In freshly cut softwood of several species, with the possible exception of balsam, water content was fairly uniform and very high in the sapwood but constantly low in the heartwood. The water content in birch was higher in the center than near the outside, with the reverse condition in the poplar. The heartwood of jack pine contained about 12 per cent water and the sapwood 52 per cent. The heartwood contained more gas than sapwood, and consequently the higher the heartwood content the better the floating properties of the log. In jack pine, heartwood contained 60 per cent of gas and the outermost part about 23 per cent. Wood and density values varied considerably. Even by allowing for the variation of density across the log the errors in measurement were scarcely reduced.

DISEASES OF PLANTS

Plant pathology, W. E. Brentzel (*North Dakota Sta. Bul. 233 (1930), pp. 97–105, figs. 9*).—As a result of tests of a large number of chemicals and proprietary compounds designed for the treatment of seed-borne and other types of cereal diseases, certain materials are recommended for use. Testing the resistance of common and durum wheats to bunt, it was found that spring wheats are most susceptible to *Tilletia laevis* and durum wheats to *T. tritici*. A few varieties were almost equally susceptible to both bunts.

Ceresan was found effective in controlling barley stripe disease, and Hochst, Abavit B, Germisan, and formaldehyde were also satisfactory.

The pasmo disease of flax, which causes a blighting of the leaves, flower buds, and stems, was checked by plowing under flax refuse, and some progress was made in the selection of resistant strains.

Careful studies were made of mosaic symptoms in potato tubers, with some results. Studies in potato-tuber disinfection suggested that the time required for the treatment of tubers with mercuric chloride may be materially reduced by adding acetic acid to the solution. In general, mercuric chloride and hot formaldehyde were the most successful treatments. In scab and scurf-infested soil the best seed treatments were not uniformly successful.

[Plant pathology, 1927] (*Ohio Sta., Co. Expt. Farms Rpts. 1927, Madison Co. Farm, pp. 2, 3; Miami Co. Farm, pp. 2, 3*).—At the Madison County Farm no beneficial effects were noted from treating good vigorous corn seed with disinfectants prior to planting. Applying fertilizers in the hill was beneficial in point of yield but had no effect on root rot. In a trial of various rotations for corn at the Miami County Farm no evidence was found that corn root rot need be considered in determining the frequency of corn in the rotation.

[Plant pathology, 1928] (*Ohio Sta., Co. Expt. Farms Rpts. 1928, Belmont Co. Farm, pp. 2, 3; Mahoning Co. Farm, pp. 2, 3; Washington Co. Farm, pp. 2, 3*).—Comparisons at the Belmont County Farm of sulfur-lime dust and spray on Rome apple trees showed that 80 per cent sulfur dust gave equally as good control of scab in 1928 as did the spray. Brooks spot was controlled considerably better by spray than by dust.

The European red mite was present to a rather serious extent, and it is advised that a dormant spray of oil emulsion or miscible oil be used in the early spring.

At the Mahoning County Farm spraying gave better control of scab on susceptible apple varieties than did dusts, although good commercial control was obtained with dusts. On scab-resistant varieties dusts gave satisfactory control, with considerable saving in time.

Comparisons at the Washington County Farm of dust and spray for controlling apple scab were in favor of spraying. However, the dusted fruit yielded an equal proportion of A-grade apples, and dusting was found easier and more rapid than spraying.

Plant diseases new to Manitoba, G. R. Bisby and I. L. Conners (*Sci. Agr., 8 (1928), No. 7, pp. 456–458*).—Potato late blight (*Phytophthora infestans*), reported vaguely before this time from western Canada, was found in the autumn of 1927 at Portage la Prairie, Otterburne, and Miami. Grape downy mildew (*Plasmopara viticola*) appeared threateningly in June, 1927, at the agricultural college. It is thought to have arrived in the form of air-borne spores, as it occurs in Minnesota. Clover powdery mildew (*Erysiphe polygoni*) appearing suddenly in the eastern States in 1921, reached Manitoba in 1922, and was locally serious in 1923, but not in 1924 or later. Red clover rust (*Uromyces fallens*), found first in 1922, and annually since, is not a serious disease. Onion smut (*Urocystis cepulae*), first found near Winnipeg by W. P. Fraser in 1922, and seen in 1924 and 1925, appears not to thrive in Manitoba. Currant powdery mildew (*Sphaerotheca mors-uvae*) apparently came in during 1924, and is injurious each year on black currants. The mildew on gooseberry, supposedly another physiologic form, apparently does not occur in Manitoba.

Alfalfa downy mildew (*Peronospora trifoliorum*), found at Brandon in 1921 and at Winnipeg in 1923, and subsequently, causes slight injury locally. Alfalfa leaf spot (*Pleosphaerulina briosiana*), found at Brandon in 1923, is of no economic importance. Pea anthracnose (*Colletotrichum pisi*) caused some injury in 1923 at Brandon. Plum brown rot (*Sclerotinia* sp.), found in damp years, as 1922 and 1927, appears not to find the climate generally favorable. Maize ear or cob rot (*Basisporum gallarum*) has long been present and is not uncommon. *Diplodia zeae* has not been found on maize in Manitoba. The fungus *Sclerotinia sclerotiorum* is common in Manitoba, causing injury to sunflowers, red clover, alfalfa, carrots, parsnips, lettuce, dahlias, cucumbers, and cabbage, and occurring on wild Canada thistle, nettle, sow thistle, and *Iva xanthifolia*. The sclerotia easily withstand the Canadian winters.

Spinach downy mildew (*Peronospora effusa*) appeared in 1926, though the organism has been found on lamb's quarters since 1920. Downy mildew (*Plasmopara halstedii*) on cultivated sunflower was found only in 1925 at Winnipeg, though the organism of the same name has been present each year on wild Compositae. Barley leaf rust (*Puccinia anomala*) was definitely determined in 1927 on several areas. Snapdragon rust (*Puccinia antirrhini*) was reported for 1919 and collected in 1920, since which year it has been injurious. Corn rust (*P. sorghi*), found in 1922, has since been common on maize. The Grand Rapids disease of tomato (*Aplanobacter michiganense*) was first collected at Brandon in 1927.

The dry atmospheric conditions of western Canada are said to serve as an effective check against certain diseases.

Seed treatments for the control of seedling blight in cereals, P. M. Simmonds and G. A. Scott (*Sci. Agr., 8 (1928), No. 8, pp. 502–511, figs. 4*).—In greenhouse experiments to determine the values of cereal seed treatments, natural soil infection and artificial inoculations with the seedling blight fungi *Fusarium culmorum* and *Helminthosporium sativum* were secured, and use was made of the solutions Semesan, Germisan, Uspulun, Tillantin, and formalin, and of the dusts Segetan, Urania, Dupont Nos. 12, 42, 46, 49, and 57, sulfur, and copper carbonate.

Semesan, Germisan, Uspulun, and Dupont No. 12 showed a distinct protective influence as regards the cases of natural soil infection and artificial inoculation. Formalin and sulfur were very unsatisfactory.

The control of bunt or stinking smut of wheat, F. D. Heald and E. F. Gaines (*Washington Col. Sta. Bul. 241 (1930), pp. 30, figs. 3*).—Two species of bunt (*Tilletia tritici* and *T. laevis*) were found in all the principal wheat-producing sections of Washington, with *T. tritici* the predominant species. Three physiological strains of *T. tritici* and four of *T. laevis*, differing in their capacity for infecting given varieties, were isolated. No immune commercial variety of spring wheat was found, although Marquis was quite resistant.

Studies of seed disinfection as a control for bunt in spring seed wheat showed formaldehyde to be most effective, with copper sulfate second and copper carbonate third. Pure copper carbonates of different brands were not significantly different, but compounds of copper carbonate were not always equally effective. The gas grain treater did not give good results.

The control of bunt in winter wheat was complicated by the heavy soil contamination from wind-blown spores present in the summer-fallow fields at seeding time. The percentage of smutted heads was found to be a fair index to actual damage. The most promising resistant varieties of winter wheat were Turkey, Albit, and Ridit, the last being conspicuous because of high resistance to all of the physiological forms of bunt tested. Seed treatment of winter wheat is recommended, except for immune or highly resistant varieties. Copper sulfate was the most effective disinfectant, with copper carbonate a close second and Ceresan highly promising.

Early seedings previous to September 15 were generally low in or free from smut, with those between September 15 and early October most severely attacked. Seeding about September 16 or slightly earlier is recommended. The fundamental features influencing severity of smut infection are soil temperature, soil moisture, and the degree of soil contamination. A soil temperature between 45 and 50° F. is deemed highly favorable for infection.

Anticryptogamic treatments for cereal rust and smut in relation to seed germinability [trans. title], G. VIVOLI (*Ann. Tec. Agr., 1 (1929), No. 4, I, pp. 469–493; 1–2 (1929), Nos. 5, I, pp. 614–630; 6, I, pp. 742–792*).—The history of attempts at controlling cereal rust and smut is indicated very summarily for the period 1756–1858, briefly for the periods 1859–1899, 1900–1904, 1905–1909, and by years for 1910–1928, with a bibliography of 444 titles representing practically the whole span of those years.

Dusting with sulphur for the control of leaf and stem rust of wheat in Manitoba, D. L. BAILEY and F. J. GREANEY (*Sci. Agr., 8 (1928), No. 7, pp. 409–432, figs. 18*).—Experimentation previously noted (E. S. R., 58, pp. 46, 546) having established the effectiveness of sulfur dusting in controlling wheat stem and leaf rust and having shown also the existence of limitations in the effectiveness of this method under the existing conditions, the feasibility of securing effective control of wheat rust and of obtaining comparable results by the same procedure in different years was tested in repetition and extension of the fortieth-acre plat experiments dealing with the effectiveness of various rates and frequencies of dusting. Experiments were added to determine the influence of time at which dusting was begun (in relation to the developmental stage of the rust epidemic) and the effect of the addition of an oxidizing agent (1 per cent potassium permanganate) to the sulfur dust. This work is presented in descriptive and tabular form with discussion of results in detail.

It is thought that the results already obtained, although they justify the continuance of this work, can be evaluated accurately only if considered in relation with the season, which, in the present instance, was unusual in several respects, so that the test is considered as unusually exacting and severe. The results are regarded as distinctly encouraging. The airplane is shown to be well suited to the work of applying the dust over large areas, though the cost mounts and dust-flow control is difficult over small acreages. Supposedly, a 3-year program would be necessary to determine the limits of practicability of the method in relation to costs.

"Halo spot" of beans and kudzu, B. B. HIGGINS (*Georgia Sta. Bul. 161 (1930), pp. 21, figs. 5*).—Studies of the symptoms and of the growth on various culture media and of the results of inoculations led to the conclusion that halo spot of beans and a similar disease of kudzu are produced by a single organism (*Bacterium medicaginis phaseolicola*), thus corroborating earlier work by F. Hedges.[1] Evidence was secured that the bacteria overwinter in cankers on living kudzu vines and spread from plant to plant chiefly through the medium of spattering raindrops. It is concluded that kudzu infections are important only in the case of near-by bean fields. The principal hazard appeared to be infected seed beans, and two seed treatments, mercuric chloride and Semesan, were tried with good results. It is urged, however, that growers obtain disease-free seed.

Bean varieties varied greatly in susceptibility, a strain of Refugee, for example, being highly resistant, while Bountiful was extremely susceptible, with other varieties graduated between them. Frequent rainfall and high humidity tended to increase the damage produced by the disease. It is believed that disease-free seed may be produced in the Piedmont section if plantings are made in June or July.

[Flax wilt studies in North Dakota] (*North Dakota Sta. Bul. 233 (1930), pp. 46, 49*).—In attempts by C. I. Nelson to obtain a fraction of protein from the mycelium of the flax-wilt organism (*Fusarium lini*), which might serve to determine serological relationship between the various physiological strains of the fungus, fairly large quantities of fat-free mycelium were obtained with certain media. A process of protein extraction was determined, which culminated in the precipitation of the globulins by electrodialysis. Animals sensitized to this globulin yielded a precipitin of low titer and a fair degree of selectivity.

Decided losses in resistance to wilt observed in certain strains of flax which were brought back to North Dakota after several years in Texas are explained by H. L. Bolley in the light of the possibility that some root-destroying organism returning on the seed may have become active.

A pepper fruit rot new to the United States, B. B. Higgins (*Georgia Sta. Bul. 162 (1930), pp. 10, pls. 3*).—Detailed studies were made of the symptoms and life history of a newly discovered and potentially serious ripe rot of the pepper, a disease which has caused serious damage in Georgia in the past two seasons. The disease was found to be due to a fungus apparently identical with *Vermicularia capsici*, which is known to cause a die-back and fruit rot of the chili pepper in India. The fungus is seed borne both internally and externally, and since seed treatments were not effective for internal infection it is deemed imperative that seed be taken from disease-free fruits. It is not yet established whether the organism lives over winter in the soil or on the diseased plant.

Potato blight and the biology of the causal fungus [trans. title], **K. O. Müller** (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1928), No. 1, pp. 197–211, fig. 1*).—This is in the main an account of the study of the variability of *Phytophthora infestans*, with particular reference to the availability of biological races and, in some detail, the materials employed, the virulence of the isolations toward different potato varieties, and the morphology of the sporangia obtained from different isolations of the potato-blight organism.

Morphology of Phytophthora infestans in potato [trans. title], **J. Szymanek** (*Compt. Rend. Acad. Sci. [Paris], 184 (1927), No. 10, pp. 620–622, figs. 5*).—Forms, relations, and changes are shown or described as observed in the mycelium and haustoria of *P. infestans* within potato tubers.

"Sprain" of potatoes, S. Burr (*Agr. Prog. [Agr. Ed. Assoc., London], 6 (1929), pp. 64–66*).—The present study dealt with 18 potato varieties (all new from Scotland except Kerr Pink), grown on very infectious soil in order to ascertain any varietal susceptibility to sprain. Figures tabulated cover both number and severity of attacks in storage on different varieties, also the results of control measures. The disease develops in storage. "The result of green manuring as a control of the disease leads one to recommend its use as a practical measure of control."

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[1] Phytopathology, 20 (1930), No. 1, p. 140.

Potato seed treatment, C. H. Plath (*North Dakota Sta. Bul. 234* (*1930*), *p. 21*).—Comparisons of several methods of seed treatment showed the hot formaldehyde and mercuric chloride treatments to be most effective. Both of these treatments gave profitable results in the control of scab and scurf and in the reduction of blackleg disease.

Ringing fruit trees sometimes spreads blight, H. A. Cardinell (*Michigan Sta. Quart. Bul.*, *13* (*1930*), *No. 1*, *pp. 12–15*, *figs. 2*).—Ringing by scoring twice with a knife blade without removing the included bark caused serious blight infection of Baldwin apple trees in a commercial orchard in 1929. Of 437 Baldwins ringed, 146 developed infection in the ringing wounds, but only one of 176 Northern Spys ringed at the same time developed the trouble. It is suggested that knife blades used in ringing should be dipped after each cut in a mercury-glycerine disinfectant, the formula for which is given.

The control of the American gooseberry mildew in Northern Ireland, A. E. Muskett and E. Turner (*Agr. Prog.* [*Agr. Ed. Assoc., London*], *6* (*1929*), *pp. 67, 68*).—This paper deals with the results thus far obtained from experiments started about five years earlier, seeking control measures against American gooseberry mildew. Excellent results have been consistently obtained by spraying twice in summer with ammonium polysulfide 1:199 with 4 lbs. of soft soap per 100 gal. Lime sulfur 1:99 with either flour paste or skim milk also gave good results. The first spraying was applied immediately after the bushes had flowered, and the second from two to three weeks later. Early spraying is extremely important. As a combined fungicide and insecticide for controlling American gooseberry mildew and gooseberry sawfly, lead arsenate paste at the rate of 2.5 lbs. per 100 gal. with either of the polysulfide spray fluids has given good results. Although in some seasons serious leaf scorch resulted from the use of the combined spray, no scorching was observed in any season when hydrated lime was added at the rate of 5 lbs. per 100 gal. It was more difficult to obtain such a high measure of control in the case of very young bushes, but the best results were obtained from ammonium polysulfide and soft soap.

Polysulfide sprays should not be used on varieties of the "sulfur" type, and the best results have been obtained by spraying the bushes in February with 2 per cent caustic soda followed by two summer sprayings with washing soda (2 oz. per gallon plus 4 lbs. of soft soap per 100 gal.). It is claimed to have been definitely shown that winter spraying with 2 per cent caustic soda gives a slight control of the disease, and caustic soda followed by washing soda is considered the best alternative now at hand to polysulfide sprays. The cost of spraying with the most promising spray fluids used ranged from 4 to 7.5 per cent of the crop value during the 5-year period.

The dead arm disease of grapes in Ontario.—A preliminary study, L. C. Coleman (*Sci. Agr.*, *8* (*1928*), *No. 5*, *pp. 281–315*, *figs. 10*).—Grapevine dead arm disease, which has become within recent years the most serious disease with which Ontario growers have had to contend, was studied from June, 1926, to the premature close of the work in 1927, and this study is reported upon preliminarily.

The disease is present in all important grape-growing areas of the Province, and field estimates show an infestation on susceptible varieties of from 11 to 50 per cent in severely attacked vineyards. Marked varietal differences of infestation are evident, most of the important commercial varieties being decidedly susceptible, among these Campbell Early, Moore Early, and the standard varieties Concord and Worden. Niagara is the only important commercial variety that is resistant. The symptoms are described. Damage done is due chiefly to loss and to slow replacement of vines, appreciable crop reduction attending the appearance of typical leaf symptoms.

The stem and arm lesions, which may be present several years before leaf and branch symptoms occur, apparently result from the action of a typical wound parasite. The perfect stage of the causal organism, *Cryptosporella viticola*, has not been found in Ontario. The conidial fructifications, regarded as the chief source of infection via pruning wounds, are formed abundantly near the margins of the lesions, and spores are emitted from about May 1 to September 1, if not later.

Control measures include marking in June the affected portions below the lowest stem lesion and their removal at pruning time, and spraying the pruning wounds once or twice in May to prevent infection from the spores then emitted.

Fungoid diseases of coffee in Kenya Colony, J. McDonald (*Kenya Colony Dept. Agr. Bul. 21 (1928), pp. 24, figs. 4*).—"No new disease of importance in coffee has been reported since the publication of the last bulletin in 1925 [E. S. R., 56, p. 455], but certain diseases have appeared in new districts or in more severe form than had previously been experienced. Investigations and field observations in the interval have added to the general knowledge of coffee diseases, and such new information has been incorporated in the present bulletin wherever it has been possible sufficiently to confirm its reliability."

The present report deals in systematic form with plant diseases in general; the leaf disease or rust (*Hemileia vastatrix*), brown blight (*Colletotrichum coffeanum*), brown eye spot (*Cerocsport coffeicola*), and black blight or sooty mold (*Capnodium brasiliense*); the berry diseases, brown blight (*Colletotrichum coffeanum*) and black berry disease (*C. coffeanum* v.); the stem diseases, pink disease (*Corticium salmonicolor*) and anthracnose (*Colletotrichum coffeanum*); the root diseases (mostly unimportant), drying (*Rhizoctonia lamellifera*—recently renamed *Macrophomina phaseoli*) and other phases indicated, with accompanying or suspected organisms, including *Armillaria mellea*, *Fomes lamaoensis*, and the mealy bug (*Pseudococcus citri*); the nursery diseases, seedling disease (*R. solani*), widely distributed in Kenya on coffee and other hosts; and the physiological diseases, die-back, black tip, and chlorosis.

Proportions and methods are given as regards Bordeaux mixture, carbide mixture, and a spray sticker.

Ectostroma liriodendri, so called, on Liriodendron tulipifera [trans. title], C. Killian and R. G. Werner (*Bul. Trimest. Soc. Mycol. France, 44 (1928). No. 1, pp. 63–68*).—An account is given regarding a study at Strasburg of a fungus associated with the appearance regularly in May of a pathological condition in *L. tulipifera*. The associated fungus, said to have been variously named in connection with descriptions here alleged to be in part inadequate, is designated as properly *Stigmina liriodendri*.

Notes on attack by Rhizoctonia crocorum on Sitka spruce (Picea sitchensis), H. Watson (*Scot. Forestry Jour., 42 (1928), pt. 2, pp. 58–61*).—Having noted in a nursery of trees two years old on an estate in Invernessshire, late in April, 1928, a characteristic yellowing of Sitka spruce (*P. sitchensis*) in two areas within which the plants were dead, the author ascertained that the collar was surrounded by a violet-colored fructification of *Helicobasidium purpreum*, which in some cases extended to lower branches or spread over the soil, the roots showing definite signs of rot, readily separating from the cortex, and having a brown stain in the wood. Strands of mycelium were easily detachable from the roots, small black dots showed on the bark, and characteristic cushions on the bark indicated *Rhizoctonia crocorum.*

This tract carried potatoes in 1922, with no manure or green crops since that time. Scots pine was planted in 1923 and 1924, European larch in 1925, and Sitka spruce in 1926. White clover (*Trifolium repens*) was abundant and healthy on this area, but sheep's sorrel (*Rumex acetosella*) was dying in places where the roots showed numerous infection cushions of *Rhizoctonia crocorum*. Details are given of the meteorological records. "The balance of the evidence is considered to favor the view that *H. purpureum* is the perfect stage of *Rhizoctonia crocorum.*"

Keithia thujina Durand: A disease of nursery seedlings of Thuja plicata, N. L. Alcock (*Scot. Forestry Jour., 42 (1928), pt. 2, pp. 77–79, figs. 3*).—In 1918, *K. thujina*, the cause of a leaf blight of nursery plants of *T. plicata*, killed large numbers of seedlings in the forestry nursery in Queen's County, Ireland, and this disease has since been troublesome at many stations in England, Scotland, and Ireland. The symptoms and course of the disease in Thuja are described.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The principles of biological control, W. R. Thompson (*Ann. Appl. Biol., 17 (1930), No. 2, pp. 306–338*).—In this discussion of biological control (E. S. R., 62, p. 851), the author considers the nature (pp. 307–310), the factors (pp. 310–314), the objects (pp. 314–316), the occasions for (pp. 317–334), and the results of experiments (pp. 334–338).

The biological control of noxious weeds, R. J. Tillyard (*Roy. Soc. Tasmania, Papers and Proc., 1929, pp. 51–86, pls. 8, fig. 1*).—This is a discussion of the control of noxious weeds in Australia and New Zealand, particularly by insects. It includes a list of 38 references to the literature.

The food and feeding habits of some Corvidae: The carrion crow, hooded crow, magpie, and jay, W. E. Collinge (*Jour. Min. Agr.* [*Gt. Brit.*], *37 (1930), No. 2, pp. 151–158, figs. 4*).—Having previously reported upon the food and feeding habits of the jackdaw and rook (E. S. R., 41, p. 454), the author now takes up the economic status of four other members of the family Corvidae. He finds that the average amount of injurious insects destroyed by the four species is 21.6 per cent, of mice and voles 11.4, and of slugs and snails about 3 per cent. Thus 36 per cent of their food is material whose destruction is of direct benefit to the farmer and fruit grower. Injuries to the extent of about 18 per cent are recorded, fully half of which consist in the destruction of the eggs and young of the wood pigeon, blackbird, gulls, and ducks.

A guide to the birds of Southern Rhodesia and a record of their nesting habits, C. D. Priest (*London: William Clowes & Sons, 1929, pp. XIX+233, pls.* [*15*], *figs.* [*115*]).—Following an introductory account, the work deals with the birds of Southern Rhodesia arranged in alphabetical order (pp. 1–185) and includes a notice relating to the protection of birds in the Salisbury municipality (p. 187), extracts from the game laws of Southern Rhodesia (p. 188), a systematic list of birds that have been recorded in Southern Rhodesia (pp. 189–219), an alphabetical list of the birds of Southern Rhodesia and the migrants to Southern Rhodesia (pp. 221–232), and a systematic list of the orders of birds (p. 233).

A general textbook of entomology, A. D. Imms (*London: Methuen & Co., 1930, 2. ed., rev., pp. XII+703, figs. 607*).—A revised edition of the work previously noted (E. S. R., 53, p. 651). In this edition various additions and emendations have been made, the most important being the revised classifications affecting the orders Dermaptera, Isoptera, and Thysanoptera, the supplementary literature at the end of many of the chapters, and the notes on recent advances in the subject incorporated in the addenda.

Striking entomological events of the last decade of the nineteenth century, L. O. Howard (*Sci. Mo., 31 (1930), No. 1, pp. 5–18*).—A review of some of the more important developments in economic entomology in the United States.

Fourth International Congress of Entomology, Ithaca, August, 1928.—Vol. I, Proceedings, edited by K. Jordan and W. Horn (*Tring (Herts), Eng.: K. Jordan, 1930, vol. 1, pp. VIII+83, pl. 1*).—This first part of the proceedings of the congress, of which the second part has been noted (E. S. R., 62, p. 646), gives general information and a list and photograph of members and others who attended the congress.

Directory of field activities of the Bureau of Entomology (*U. S. Dept. Agr., Misc. Pub. 83 (1930), pp. 56, pl. 1*).—A handy pocket directory of the field activities of the Bureau of Entomology.

[Report of work in entomology at the North Dakota Station], J. A. Munro (*North Dakota Sta. Bul. 233 (1930), pp. 71–75, figs. 3*).—In apicultural work observations indicated that the medium-sized colony of bees winters over more satisfactorily in the cellar than does either the large or small sized colony. Observations conducted in a number of bee cellars in the State indicated that more trouble is experienced in cellar wintering due to overcrowding of the hives, with consequent high temperature, than from any other cause. In the cellars in which high temperatures occurred many of the bees vacated the hives and went to the cellar floor. Later, when normal temperatures were resumed, these bees entered the lower tier of hives, with the result that many of the occupants died of starvation during the latter part of winter while the upper tiers of hives wintered over without appreciable loss. The loss during the winter period, ascertained by weighing the hives when they were placed in winter quarters and again at the time of moving them out in the spring, averaged per hive in 1927–28 11.25 lbs. and in 1928–29 17.1 lbs. Excessive rainfall was found to be the main cause of the lower honey yield in 1928.

The fumigation of brood combs, from colonies having American foulbrood, for 72 hours with formalin at the rate of 5 lbs. per 1,000 cu. ft. of inclosed space failed of complete disinfection. Branding the infected hive through use of a gasoline blowtorch to heat the brand and also sterilize the hive tool was found to be the most practical and reliable method of marking.

An account follows of the Bertha army worm, which first attracted attention in 1928 as a pest of major importance, particularly in the northern counties of the State. Its injury was mainly to fields of flax and sweetclover during July and August, caused largely by the stripping off of the leaves and seed pods. A survey of the damage indicated that the average loss in upwards of 11 fields examined was slightly over 15 per cent. Injury to sweetclover fields appeared greater than that to flax. Fair results were obtained from the use of arsenical dusts (1 part of arsenical to 7 of hydrated lime) as a control. Deep disking or other cultivation in the infested fields will do much to destroy the pest, which enters in late August and winters in the soil to the depth of 2 in.

[Contributions on economic insects] (*Ztschr. Angew. Ent., 15 (1929), No. 3, pp. 435–651, figs. 86; abs. in Rev. Appl. Ent., 18 (1930), Ser. A, No. 4, pp. 184–187*).—The contributions here presented (E. S. R., 63, p. 253) are as follows: Studies of the Epidemiology, Ecology, and Physiology of the African Migratory Locust (*Schistocerca gregaria* Forsk.), known as the desert locust, by F. S. Bodenheimer et al. (pp. 435–557); The Development of Methods for Denoting the Flight Strains of Periodically Occurring Insects, by H. Prell (pp. 558–564); Investigations on the Areas of Injury Caused by Some Agricultural

Pests in Germany and the Environmental Factors Concerned, Based on Statistical Data, with a bibliography of 288 titles, by W. Schnauer (pp. 565–627); Sugar Beet Pests in Argentina, by O. Günther (pp. 628–632); Parasitic Diseases of the Mediterranean Flour Moth, by E. Schimitschek (pp. 632–635); *Ptinus raptor* Str. as a Pest in the Bee Hive, by K. Brassler (pp. 635–637); Thoughts Prompted by the Campaign against *Hylotrupes bajulus* in Denmark, by W. Deckert (pp. 637, 638); *Ptinus tectus* Boield. as a Pest of Paprika, by H. von Lengerken (p. 639); An Outbreak of Psocids, by H. W. Frickhinger (p. 640); Crabronids as Occupants of Old Tree Trunks, by G. Wellenstein (pp. 640–644); The Period of Development of Bark Beetles in Sweden (pp. 644, 645); Notes on *Xylodrepa* (*Sylpha*) *quadripunctata* L., by B. A. Marcus (p. 645); and Analysis of the Stomach Contents of Native Birds as a Basis for Knowledge of the Interrelationship of Bird and Insect, by von Vietinghoff-Riesch (pp. 646–651).

[Economic insects and means for their control] (*Union So. Africa Dept. Agr., Pan-African Agr. and Vet. Conf., Pretoria, 1929, Papers, Agr. Sect., pp. 238–242, 255–308, pls. 8; Rpt. Proc., pp. 94–101, 103–105, 108–127*).—The following contributions on economic insects and means for their control, presented at the Pan-African Agricultural and Veterinary Conference held at Pretoria in August, 1929, are included in the report of the agricultural section: Control of Maize Stalk Borers, by T. J. Anderson (pp. 238–242); Insect Pests of Cotton and Tobacco in South Africa, by T. J. Naudé (pp. 255, 256); The Pink Cotton Bollworm (*Gelechia gossypiella*) in Belgian Congo, by C. Seydel (pp. 257, 258); Biological Control in Kenya Colony, with Special Reference to the Problem of the Common Coffee Mealybug, *Pseudococcus lilacinus* Ckll., by H. C. James (pp. 259–263); The Migratory Locust Problem in Africa, by R. H. Williams (pp. 263, 264); and A Contribution to the Biology of the Brown Swarm Locust *Locustana pardalina* (Wlk.) and Its Natural Enemies, by J. T. Potgieter (pp. 265–308).

The discussions of these subjects are included in the report of the proceedings.

[Entomological work in Tanganyika Territory], A. H. Ritchie (*Tanganyika Ter. Dept. Agr. Ann. Rpt. 1928–29, pt. 2, pp. 29–34*).—The work reported upon deals with mulberry silkworms, silkworm diseases, varieties of mulberry, mulberry pests, beekeeping, coffee and cotton pests, and locusts.

Vegetable insects and their control, A. V. Mitchener (*Manitoba Dept. Agr. and Immigr. Circ. 97 (1930), folder*).—A practical account presented in tabular form.

A survey of olive pests, H. M. Morris (*Cyprus Dept. Agr. Bul. 2 (1930), pp. 10, figs. 4*).—This is a report of a survey made of olive pests in Cyprus by the government entomologist during the fall of 1928 and of 1929.

Insects found associated with cacao, spices, and dried fruits in London warehouses, O. W. Richards and G. V. B. Herford (*Ann. Appl. Biol., 17 (1930), No. 2, pp. 367–395, pls. 10*).—This consists of an annotated list, arranged systematically by orders, of insects associated with cacao, spices, and dried fruits in London warehouses as observed in connection with a list of 163 references to the literature. Tables are given for the separation of many of the species involved, representing the genera Carpophilus, Tenebroides, Laemophloeus, Dermestes, Gnathocerus and Tribolium, Ephestia, and Drosophila. Many of the insects appear to have been recorded from Great Britain for the first time.

Experimental investigations of the transmission of buffalo disease by insects [trans. title], O. Nieschulz and F. C. Kraneveld (*Zentbl. Bakt.* [*etc.*], *1. Abt., Orig., 113 (1929), Nos. 5–6, pp. 403–417*).—In experimental transmission work in which rabbits were used the authors found that septicemia hemorrhagica bubalorum of the buffalo in Java can be transmitted by several dipterans, including *Tabanus rubidus*, *Chrysops dispar*, the stable fly, *Musca inferior*, *Lyperosia exigua*, *Anopheles fuliginosus*, *Armigeres obturbans*, and the yellow fever mosquito.

The relation of evaporation to killing efficiency of soap solutions on the harlequin bug and other insects, B. B. Fulton (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 625–630*).—Tests of various known contact insecticides on the harlequin bug brought out the fact that certain soap solutions are very effective, but only under ordinary conditions of low evaporation. Further experiments under known rates of evaporation showed that the efficiency of soap solution is indirectly proportional to the rate of evaporation. The addition of hydroscopic substances did not materially increase the effectiveness. Tests with several kinds of soap and two other species of insects showed that the relationship is probably a general one.

Naphthalene fumigation at controlled concentrations, A. Hartzell and F. Wilcoxon (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 608–618, pls. 2, fig. 1*).—A method of maintaining a constant concentration of naphthalene is described as an improvement on former methods of fumigation with this substance. A concentration of 0.008 lb. of naphthalene per 1,000 cu. ft. of air maintained for 8 hours was found to kill the red spider mite (*Tetranychus telarius*), the cyclamen mite, the onion thrips, and the black grain thrips (*Heliothrips femoralis*), without injury to a number of plants that have proved intolerant to methods used previously.

Physical and chemical properties of commercial arsenical insecticides.—I, Manganese arsenate, F. E. Dearborn (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 630–635*).—It is pointed out that "the patented methods of making manganese arsenates for insecticidal use consist in treating a manganese compound, such as pyrolusite, with white arsenic (As_2O_3) in the presence of nitric acid as a catalyst. The manganous arsenate formed is partly converted to the trimanganoarsenate by treatment with manganese carbonate to lower the water soluble arsenic content. The brown color of the insecticide is produced by treating the mixed arsenates with lime, which decomposes some of the arsenates with the formation of calcium arsenate and hydrated oxides of manganese. Burnt umber is also generally added to cheapen the product.

"The chemical analysis of the commercial insecticide shows that the total arsenic content runs close to 40 per cent calculated as arsenic pentoxide As_2O_5, that the water soluble content ranges from 0.7 to 1.5 per cent calculated as arsenic pentoxide As_2O_5, and that the total manganese calculated as manganous oxide (MnO) ranges from 31.6 to 40.7 per cent. The lime content, present mostly as calcium arsenate, ranges from 15.5 to 16.4 per cent calculated as calcium oxide (CaO).

"The commercial manganese arsenate insecticide is a complex mixture of various arsenates of manganese, calcium arsenate, oxides of manganese, and smaller quantities of aluminum, iron, silica, etc. The composition of different samples is not the same."

The comparative insecticidal value of different species of Derris, E. R. de Ong (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 619–624*).—In a comparison made of the insecticidal values of extracts and powders made from identical species of the genus Derris, all were found valuable.

Some influences of location upon light trap catches, W. C. Cook (*Canad. Ent., 62 (1930), No. 5, pp. 95–98*).—In this contribution from the Montana Experiment Station it has been found that between two similar light traps operated concurrently at Bozeman, Mont., during two seasons, one in a field and the other in a third-story window of a building, the field trap caught a slightly greater number of moths by night but not nearly so many species either per collection or for the season. A general comparison of the catches shows that the building trap attracted many species of moths whose breeding grounds are at a distance, while the field trap attracted mainly those breeding locally.

Termites and termite damage, with preliminary recommendations for prevention and control, S. F. Light, M. Randall, and F. G. White (*California Sta. Circ. 318 (1930), pp. 64, figs. 50*).—This circular, prepared by the Termite Investigations Committee, covers the same ground as the account by Light, previously noted (E. S. R., 61, p. 356). It presents in a general and nontechnical form such additional knowledge of the local termites and such conclusions as the committee has tentatively arrived at as to the most satisfactory methods for the prevention and control of termite damage. Section 1 on Biological Information concerning Termites (pp. 5–37) was prepared by Light, section 2 on Prevention and Eradication by Chemical Treatment (pp. 38–49), by Randall, and section 3 on Prevention by Construction Methods (pp. 50–62), by White.

A report of the activities of the Palestine Locust Service in Transjordania during 1929, G. E. Bodkin (*Palestine Dept. Agr. and Forests, Agr. Leaflets, 1. ser., Anim. and Insect Pests No. 8 [1930], pp. 25, figs. 8*).—A report of control work conducted with the destructive locust *Schistocerca peregrina* Forsk. in Transjordania during the months of March, April, and May, 1929.

Biology of the Hemiptera, H. Weber (*Biologie der Hemipteren: Eine Naturgeschichte der Schnabelkerfe. Berlin: Julius Springer, 1930, pp. VII+543, figs. 329*).—This work on the biology of the hemipterous insects includes a 14-page list of references to the literature.

Contribution to experimental parasitology.—IV, Further studies of Cimex lectularius L. and C. rotundatus Sign. [trans. title], A. Hase (*Ztschr. Wiss. Biol., Abt. F, Ztschr. Parasitenk., 2 (1930), No. 3, pp. 368–418, figs. 9*).—The author's studies (E. S. R., 42, pp. 152, 358; 58, p. 158) are reported in connection with a list of 51 references to the literature.

The common green capsid bug (Lygus pabulinus) as a pest of sugar beet, C. L. Walton and L. N. Staniland (*Jour. Bath and West and South. Counties Soc., 6. ser., 4 (1929–30), pp. 152, 153, pl. 1*).—The data here presented supplement the account of Petherbridge and Thorpe (E. S. R., 60, p. 846). It is shown that the pest may originate in hedgerows of bramble and bindweed from which it spreads and in the absence of weeds in the field attacks the sugar beet. Good results were obtained from the application of a nicotine dust.

Studies of the Psyllidae, III, IV [trans. title], F. B. Boselli (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 22 (1928–29), pp. 204–218, figs. 5; 23 (1930), pp. 13–27, figs. 8; abs. in Rev. Appl. Ent., 17 (1929), Ser. A, Nos. 8, pp. 458, 459; 12, pp. 732, 733*).—The following contributions are in continuation of those previously noted (E. S. R., 62, p. 154): III, Notes on Some Nymphs of Pachypsyllini, and IV, Biology and Development of *Spanioza galii aspinovelutina* (Sulc.).

The pine tortoise scale, Lecanium numismaticum Pettit and McD., in Nebraska, L. M. Gates (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 544–547*).—This scale has recently caused serious injury to plantings of Jack pine and Scotch pine in the sand-hill region of Nebraska. In control work an application of a commercial white-oil emulsion at from 2 to 3 per cent strength during the first two weeks of July gave excellent control of the insect without injury to the trees.

An innovation in scale control, E. A. McGregor (*Science, 71 (1930), No. 1835, p. 244, 245*).—The author reports the discovery that a very high mortality of the citricola scale (*Coccus pseudomagnoliarum* Kuw.) has accompanied the use of the extremely finely divided sulfurs applied in combating the citrus thrips in the San Joaquin Valley, Calif. In all cases the sulfurs employed were ground to the point where a high percentage of the material would pass through a 200-mesh-per-inch screen and the majority of the particles through a 300-mesh screen.

Summary of results obtained with trap baits in capturing the codling moth in 1927, M. A. Yothers (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 576–587, figs. 3*).—This is a report upon the use of attractive baits for capturing the codling moth in continuation of earlier work (E. S. R., 58, p. 260). Comparisons are made of several kinds of baits in which a total of 17,738 codling moths were captured. Considerable control is evidenced as a result of the experiments made in one orchard, although the primary purpose of the experiments was to determine the relative attractiveness of various baits. The relation of temperature fluctuations to flight activity of the moths is presented in graphs, which indicate that there is a very intimate correlation between the two.

Supplementary control measures for the oriental fruit moth, S. C. Chandler (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 596–599*).—In work in Illinois bands placed around peach trees in spring caught an average of 2.2 oriental fruit moth larvae per band up to the time of the Elberta harvest. Bands placed on Krummel October and Heath Kling peach trees after the Elberta harvest caught from 6 to 151 larvae per band for the rest of the season. An interesting larval habit in connection with banding is discussed. Paradichlorobenzene showed poor results in grower made treatments in 1928. Tests by the author in 1929 gave a kill of from 70 to 90 per cent.

Preliminary report on paradichlorobenzene solutions for the control of the lesser peach borer, Aegeria pictipes G. & R., O. I. Snapp and H. S. Swingle (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 636–638*).—Paradichlorobenzene solutions have been found by the authors very promising for the control of the larvae of the lesser peach borer in peach trees. The best of those solutions tried was that in which crude cottonseed oil was used as the solvent for the paradichlorobenzene.

International corn borer investigations: Scientific reports, II, edited by T. Ellinger (*Internatl. Livestock Expo. [Chicago], Internatl. Corn Borer Invest. Sci. Rpts., 2 (1929), pp. [11]+183, pl. 1, figs. 78*).—In continuation of the work previously noted (E. S. R., 60, p. 651), reports here presented are as follows: Biological Researches on *Pyrausta nubilalis* Hb., II, by E. Roubaud (pp. 1–21); On the Natural and Acquired Immunity of *Pyrausta nubilalis* Hb., by S. Metalnikov and V. Chorine (pp. 22–38); New Bacteria Pathogenic to the Larvae of *Pyrausta nubilalis* Hb., by V. Chorine (pp. 39–53); Experiments on the Use of Bacteria to Destroy the Corn Borer (pp. 54–59) and On the Infection of the Gypsy Moth and Certain Other Insects with *Bacterium thuringiensis*: A Preliminary Note (pp. 60, 61), both by S. Metalnikov and V. Chorine; Notes on the East European Parasites of *Pyrausta nubilalis* Hb., by T. Ellinger and H. Sachtleben (pp. 62–75); Report on Corn Borer Experiments, 1927–1928 (pp. 77–84), and Experiments with *Trichogramma evanescens* (pp. 85–89), both by A. Hase; The Corn Borer Situation in Hungary, by A. Kotlan (pp. 90–98); On the Use of *Bacillus thuringiensis* in the Fight against the Corn Borer, by B. Husz (pp. 99–105); On Some Technical Methods Applied in Corn Borer Research, by V. Vouk and B. Hergula (pp. 106–110); Insect Parasites of the Corn Borer in Northern Jugoslavia, by B. Hergula (pp. 111–127); A Contribution to the Morphology of the Tachinid Flies Bred from *Pyrausta nubilalis* Hb., by N. Baranoff (pp. 128–130); On the Infection of *Pyrausta nubilalis* Hb. by *Metarrhizium anisopliae* (Metsch.) Sor., by H.

Wallengren and R. Johansson (pp. 131–145); and The Internal Anatomy of the Larva of *Pyrausta nubilalis* Hb., by S. G. Larsson (pp. 146–159).

These reports are followed by a report of the First International Corn Borer Conference held at the Pasteur Institute of Paris, April 25–27, 1929, with the following papers: Scientific Problems Relating to the Corn Borer, by E. Roubaud (pp. 169–172): The Policy of Scientific Corn Borer Investigations, by V. Vouk (pp. 173–176); and The Administrative Aspects of the International Corn Borer Investigations, by M. Siegescu (pp. 176–180). A corn borer meeting held in Zagreb, Yugoslavia, August 26, 27, 1929, is also noted.

Investigations of the biology and control of the European corn borer in south Germany, II [trans. title], W. Zwölfer (*Arb. Biol. Reichsanst. Land u. Forstw., 17 (1930), No. 6, pp. 459–498, pls. 7, figs. 6*).—A report of work conducted in continuation of that previously noted (E. S. R., 60, pp. 560, 651, 844).

The status of the sugar cane moth stalkborer in Cuba, H. K. Plank (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 2 (1928), Sup., pp. 29–32*).—This is a brief review of the status of the sugarcane borer in Cuba.

Practicability of the hot water treatment for the boxwood leaf miner, E. N. Cory and C. Graham (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 563–565*).—The practicability of spring treatment of four varieties of the genus Buxus, using hot water at a temperature of 120° F. for 5 minutes, was demonstrated by the treatment of 2,430 plants ranging in size from 1 to 3 ft. There was slight temporary injury to tender foliage. The cost of treatment, including equipment, was about 8 cts. per plant.

The Tasmanian grass grub (Oncopera intricata Walker): A preliminary report on its life history and methods of control, G. F. Hill (*Aust. Council Sci. and Indus. Research Pamphlet 11 (1929), pp. 42, figs. 13*).—This is a preliminary report on the life history and methods of control of the larva of a moth, *O. intricata*.

A contribution to the knowledge of Tischeria gaunacella Dup. and notes on T. complanella Hbn. (Lepidoptera-Tischeriidae) [trans. title], G. Grandi (*Bol. Lab. Ent. R. Ist. Super. Agr. Bologna, 2 (1929), pp. 192–245, pls. 5, figs. 24*).—A report of studies of the biology and natural enemies of two tineid miners, the former in the foliage of Prunus and the latter in the foliage of oak and chestnut.

A simple statistical method for determining the approximate duration of the instars of leaf-mining larvae and others, R. L. Taylor (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 587–595, fig. 1*).—The author describes a simple statistical method found to have several advantages and gives comparative data on *Phyllotoma nemorata* (Fall.) and *Coleophora salmani* Hein. as examples.

Life history notes on the banana fruit-eating caterpillar (Tiracola plagiata Walk.), M. E. Temperley (*Queensland Agr. Jour., 33 (1930), No. 4, pp. 251–261, pls. 2*).—An account of a noctuid moth which has a wide distribution in tropical and subtropical regions, where it has been recorded as feeding in the larval stage on an extensive number of food plants, including many of economic importance. In addition to a general description of its several stages and a report of life history studies, colored plates are given illustrating its life stages and the nature of its injury.

Studies in cold resistance of insects, N. L. Sacharov (*Ecology, 11 (1930), No. 3, pp. 505–517*).—The author's experiments, conducted in the laboratory at the Agricultural Experiment Station at Saratov, Russia, and observations in nature show that the caterpillars of *Euxoa segetum* may be killed by autumn and winter frosts. However, the problem can not be considered as definitely solved, and further studies during a series of years and in other localities are required. The fatal point for caterpillars hibernating in the upper layers of soil is not below —5.75° C. (+21.65° F.), while for those hibernating in the lower layers the fatal point is between —7.8 and —11.1°.

Susceptibility of the caterpillars to frosts and to the severe climatic conditions of the lower Volga region prevents *E. segetum* from being a serious pest throughout the whole region. It may become a pest only in the forest-steppe zone, where there is a sufficient snow cover to prevent the soil from freezing and in the Volga delta where the winter is not long and less severe. Even in these two areas outbreaks are not always possible, since the maximum snowfalls occur during the second half of winter and by that time the caterpillars may have been killed by cold. All this explains why *E. segetum* is a relatively unimportant pest in the lower Volga region.

The progress of Hessian fly in Ohio, T. H. Parks (*Ohio Sta. Bimo. Bul. 146, (1930), pp. 154–156, fig. 1*).—In the annual wheat survey (E. S. R., 61, p. 849), a census of the insects taken in 20 counties in the main wheat-producing sections just previous to harvest showed that the Hessian fly increased in Ohio from 4.6 per cent of infested straws in 1929 to 6.8 per cent in 1930. This was a slight increase in all but 3 counties. It is pointed out that in Erie County, where the fly was not much of a pest during the winter, a field of wheat sowed two weeks before the proper date developed an infestation of 56 per cent.

Description and notes on Mayetiola avenae March (Diptera, Cecidomyidae) in Italy [trans. title], A. Ricchello (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 23 (1930), pp. 28–97, figs. 25; abs. in Rev. Appl. Ent., 18 (1930), Ser. A, No. 2, p. 43*).—A report of studies of a cecidomyiid which is a source of considerable damage to oats in the Province of Foggia, Italy. The morphological characters of its several stages resemble those of the Hessian fly—as does also the injury caused.

On the biology of the gall-midges (Cecidomyidae) attacking meadow foxtail grass (Alopecurus pratensis), including the description of one new species, H. F. Barnes (*Ann. Appl. Biol., 17 (1930), No. 2, pp. 339–366*).—The study here reported deals particularly with three midges that do serious damage to the seeding of meadow foxtail grass, namely, *Dasyneura alopecuri* (Reut.), *Stenodiplosis geniculati* Reut., and *Contarinia merceri* n. sp. All three are said to occur almost anywhere the grass is grown. It is shown that *D. alopecuri* has one brood a year, *S. geniculati* has two, while *C. merceri* has one but occasionally may have two. " Blindness " or empty husks in meadow foxtail grass is due largely to attacks of *C. merceri*, which midge does the most extended damage. Keys are given for the separation of larvae, pupae, and adults. Control measures are discussed and a method of keeping sheep on the grass until a certain safety date, i. e., a date when the crest of emergence of the female midges is over, is strongly advocated in districts where the bionomics is known.

Biological control of pear-midge (Perrisia pyri) in New Zealand: The present position, J. Muggeridge (*New Zeal. Jour. Agr., 38 (1929), No. 5, pp. 317–320, fig. 1*).—The present paper gives a brief summary of the work of establishing the parasite *Misocyclops marchali* (Kieff.) in New Zealand up to the close of the season 1928–29.

A description of the immature stages of Hippelates pusio Loew and a brief account of its life history, W. B. Herms and R. W. Burgess (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 600–603, figs. 4*).—A brief description is given with illustrations of the hitherto unknown stages of *H. pusio*, the life history from egg to imago of which was found to require about three weeks.

Malaria in Porto Rico, W. C. Earle (*Amer. Jour. Trop. Med., 10 (1930), No. 3, pp. 207–230*).—In this account it is shown that *Anopheles albimanus* is the important vector in Porto Rico. It is pointed out that sugarcane is the principal crop in malaria-infected regions and that methods of cultivation influence breeding of mosquitoes. Reclamation of some swamps by pumps and for agricultural purposes will be necessary before mosquito control will be possible in many areas. There is an increasing interest in this work. Subsoil drainage is the most hopeful solution of the problem in seepage lands and wet lands not too low. There is a more extensive use of this method of drainage each year.

In many regions antilarval work by the use of Paris green alone can be done efficiently and at low cost, but in most areas permanent efficient drainage is first advisable until larvicidal work can be carried on at a low annual cost.

The cage rearing of Anopheles quadrimaculatus, M. F. Boyd (*Amer. Jour. Trop. Med., 10 (1930), No. 3, pp. 165–175, figs. 5*).—The author has met with some degree of success in efforts at rearing generations of *A. quadrimaculatus* in a cage, the details of which are here presented.

A contribution to the knowledge of the artichoke fly (Agromyza andalusiaca Strobl) and its parasites [trans. title], A. Ricchello (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 22 (1928–29), pp. 81–147, figs. 33*).—A report of studies of the morphology, biology, and parasites of and control measures for this leaf miner of the artichoke.

The Mediterranean fruit fly eradication campaign, L. A. Strong (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 509–512*).—A brief account of the eradication work in Florida.

The Mediterranean fruit fly situation, W. Newell (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 512–523*).—A discussion of the control problem.

Susceptibility of avocados of the Guatemala race to attack by the Mediterranean fruit fly in Hawaii, H. F. Willard, A. C. Mason, and D. T. Fullaway (*Hawaii. Forester and Agr., 26 (1929), No. 4, pp. 171–176*).—Experiments in the insectary and in cages on the trees show that it is mechanically possible for the Mediterranean fruit fly to pierce the thick shell-like skin of Guatemalan avocados and cause infestation. "The small number of fruits infested under these severe conditions indicates that Guatemalan avocados have a high degree of resistance to attack, and that possibly infestation might not occur in fruits handled in the normal way. Of 1,269 fruits exposed to the fly under normal orchard conditions, 5 were found to contain fruit fly maggots. Four of these were in perfect condition, while 1 had a crack in the skin. Although these 4 fruits had skins of only average thickness for Gautemalan varieties, the fact that some of the thickest skinned varieties were infested in the insectary and cage tests would indicate that any Guatemalan fruit might become infested in the orchard. Infestation occurred in some fruits while they were in a hard, unripe condition 10 to 11 days before they were ripe enough for consumption. The thickness of the skin did not control to any great extent the ability of the fly to oviposit and cause infestation. These facts lead to the conclusion that commercial shipments of Guatemalan avocados from Hawaii would be dangerous as carriers of the Mediterranean fruit fly."

A contribution to the knowledge of the Mediterranean fruit fly (Ceratitis capitata Wied.) (Diptera, Trypaneidae) [trans. title], G. Costantino (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 23 (1930), pp. 237–322, figs. 20*).—Biological studies conducted partly in the Province of Reggio, Department of Calabria, and in Sicily, but particularly in Portici, are reported upon in connection with an 11-page list of references to the literature.

The Mediterranean fruit fly (Ceratitis capitata Wied.) (*Cyprus Gaz. No. 2041 (1930), Agr. Sup. 21, pp. 1-3*).—An account of the Mediterranean fruit fly as met with in Cyprus. It is pointed out that the practice of growing apricot, peach, fig, quince, pomegranate, and other fruit trees in citrus plantations assists the breeding of the Mediterranean fruit fly and should be avoided.

Tsetse flies, I, E. Hegh (*Les Tsé-tsés. Brussels: Belg. Min. Colon., 1929, vol. 1, pp. XIV+742, pls. 15, figs. 327*).—This work deals with the anatomy, taxonomy, biology, and natural enemies of flies of the genus Glossina. Bibliographies accompany the several chapters.

Treatment of soil to destroy the Japanese beetle, W E. Fleming and F. E. Baker (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 502-508*).—The different methods of treating soils to destroy the Japanese beetle that are now in use in commercial orchards in the infested area are briefly summarized.

The Japanese beetle in 1929, L. B. Smith (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 495-501*).—This is a summary of the known distribution of the Japanese beetle in 1929, its feeding and injuries, life history, control measures, and the results of parasite introduction.

The Mexican bean beetle, J. N. Knull (*Penn. Dept. Agr. Bul. 489 (1930), pp. 10, figs. 9*).—A practical summary of information on this pest, its life history in Pennsylvania, and control measures.

The tannia beetle, Ligyrus ebenus DeG., L. D. Cleare, jr. (*Agr. Jour. Brit. Guiana, 3 (1930), No. 1, pp. 11-23, pls. 4, fig. 1*).—An extended account of *L. ebenus*, which has been an important pest of tannias (*Xanthosoma* sp.) in the northwestern district of British Guiana for many years.

A contribution to the biology and control of the beet carrion beetle (Blitophaga opaca L.) [trans. title], H. Hähne (*Arb. Biol. Reichsanst. Land u. Forstw., 17 (1930), No. 6, pp. 499-548, figs. 10*).—An account of an economic pest in Europe that occurs in the United States but has not as yet become of importance. The biology of the beetle, first considered, is followed by an account of its economic importance in 1926 and 1927 and of means of control. A 9-page list of references to the literature is included.

Damage by the rice water weevil proved negligible, J. W. Ingram and W. A. Douglas (*Louisiana Stas. Bul. 214 (1930), pp. 8*).—A brief report is given of work with the rice water weevil conducted cooperatively with the U. S. D. A. Bureau of Entomology with a view to determining the amount of injury caused by its feeding. A screened cage 17 by 39 by 6 ft. was erected in the spring of 1924 and three others (slightly larger) in 1926. The cages, erected on typical rice land, were divided in the center, the weevils being released on one side and the other side kept free from them. Weevils to the number of 450 were released annually in the first cage and 612 in each of the other three cages, these representing the largest numbers of weevils found in rice under actual conditions.

The weight of the grain produced in the infested side of the four cages during the years 1924 to 1929, inclusive, was 118.72 lbs., and that in the uninfested sides 114.61 lbs. The corresponding weight of the straw produced in the infested sides of the cages was 206.1 lbs., and that of the uninfested sides 209 lbs. These results show that the weevil had no appreciable effect on the yield of grain and little effect on the straw.

In order to determine whether lighter grains resulted from the feeding of the larvae or "root maggots," five lots of 100 grains each from both sides of the cages were husked and weighed, the average weight from the infested sides being 2.146 gm. and for the uninfested sides 2.150 gm. Two other lots of 500 grains each were weighed and gave 10.67 gm. for the infested sides and 10.68 for the uninfested sides.

The authors conclude from the results of the cage experiments and also from intensive observations that the loss to the rice crop from such injury is negligible, and that drainage undertaken for the purpose of killing the so-called "root maggots" is never worth while. It is pointed out that drainage may, however, be necessary and worth while in order to cure other ills heretofore said to have been caused by the "root maggot."

The control of the apple blossom weevil, A. M. Massee and M. Beshir (*Jour. Min. Agr.* [*Gt. Brit.*], *37* (*1930*), *No. 2, pp. 164–171*).—In control work with *Anthonomus pomorum* (L.) it was demonstrated that corrugated cardboard may be used instead of, and in preference to, sack bands for trapping. A new method of destroying the weevil while hibernating in the sack band is described. It is shown that the weevils can be killed by spraying the bands in situ on the trees with a 10 per cent tar-distillate wash.

A contribution to the knowledge of the chestnut weevil Balaninus elephas [trans. title], C. Colizza (*Bol. Lab. Zool. Gen. e Agr. R. Ist. Super. Agr. Portici, 22* (*1928–29*), *pp. 244–262, figs 8; abs. in Rev. Appl. Ent., 17* (*1929*), *Ser. A, No. 9, pp. 492, 493*).—A report of studies of the morphology and biology of this enemy of the chestnut in Italy, also recorded from France, Germany, and Austria. A single insect parasite, *Sigalphus sculpturatus* Szepl., has been reared from the larvae in acorns.

Studies of the black vine weevil, F. F. Smith (*Jour. Wash. Acad. Sci., 20* (*1930*), *No. 10, pp. 185–188*).—This is an account of studies of *Brachyrhinus sulcatus* Fab. conducted in Pennsylvania over a period of 3.5 years—from 1925 to 1929. The observations reported include those on the life cycle in greenhouses as well as in the nurseries and control experiments under both conditions.

The presence in Georgia of Bracon mellitor Say, a parasite of the cotton boll-weevil, J. H. Miller and G. F. Crisfield (*Jour. Econ. Ent., 23* (*1930*), *No. 3, pp. 607, 608*).—The cotton boll weevil parasite *B. mellitor* has made its appearance in cotton fields in all parts of Georgia investigated. Individuals have been found in June and from then consistently until September 15, when the work was temporarily stopped. The number of weevil larvae destroyed in this manner ran as high as 18 per cent in bolls and 35 per cent in hanging squares in August in the field which was under constant observation.

Mexican sugar cane borers and the parasite Trichogramma, S. E. Flanders (*Jour. Econ. Ent., 23* (*1930*), *No. 3, pp. 603–606*).—In observations made in the State of Sinaloa, Mexico, at least three species of borers were found to be responsible for injury to sugarcane, namely, *Chilo loftini* and two species of Diatraea. A general survey showed that about 97 per cent of the stalks and 25 per cent of the joints were attacked on a sugarcane plantation located southwest of Culiacán in Sinaloa.

From work with the colonization of the egg parasite it is concluded that the native strain of Trichogramma does not give promise of controlling cane borers on the west coast of Mexico, since the two most destructive species apparently are not attacked to any extent.

Blowfly parasite: The red legged chalcid (Stenosterys fulvoventralis (Dodd)), L. J. Newman and H. G. Andrewartha (*Jour. Dept. Agr. West. Aust., 2. ser., 7* (*1930*), *No. 1, pp. 89–95, figs. 5*).—An account of the status of *S. fulvoventralis*, which gives the most encouragement of all parasites thus far tried against the blowfly. Since its discovery in the south coast country it has been established in several districts, having been reared and distributed among many sheep flocks. It is easy to handle and readily attacks the larvae and pupae of all species of sheep blowflies other than *Ophyra nigra*.

ANIMAL PRODUCTION

Value of grinding grains and roughages for livestock (*South Dakota Sta. Bul. 252* (*1930*), *pp. 56*).—The results reported in this publication are divided into three parts, with an introduction by J. W. Wilson.

I. *The cost of grinding grains and roughages*, R. L. Patty (pp. 4–8).—The average cost per ton to grind different feeds is reported in this section, ranging from 59 cts. per ton for shelled corn to $4.78 for sweetclover.

II. *The value of feeding ground grains and ground alfalfa hay to cattle, sheep, and swine*, J. W. Wilson and T. Wright (pp. 9–41).—Two-year-old steers were divided into three lots and fed rations of whole barley and whole alfalfa hay, ground barley and ground alfalfa fed separately, and ground barley and ground alfalfa mixed. At the end of the first 30 days the rations were changed, changed again after 31 days, and the third feeding period lasted 29 days. On the whole feeds the 14 head of steers gained 979 lbs., on the ground feeds fed separately 832 lbs., and on the mixed ground feeds 685 lbs. There was a wide difference in the ability of the steers to gain on the same kind of feed and under the same conditions.

Three lots of 10 calves each, averaging 372 lbs. per head, were fed for 91 days on rations similar to the above except that corn replaced the barley. The average daily gains were 2.31, 2.49, and 2.36 lbs. per head in the respective lots. Lot 3 required 26.64 lbs. more corn per 100 lbs. of gain than did lot 2. The cost per 100 lbs. of gain was 19 cts. higher in lot 2 and 32 cts. in lot 3 than in lot 1.

Three lots of 10 lambs each were fed during three 30-day periods on whole barley and whole alfalfa hay, ground barley and ground alfalfa fed separately, and ground barley and ground alfalfa mixed. The ration of each lot was changed at the end of each period. The 36 lambs made an average gain of 9.56 lbs. per head while receiving the whole feeds, 4.8 lbs. per head on ground feeds fed separately, and 4.2 lbs. on ground feeds mixed.

Three lots of 7 wethers each were fed as above except that corn replaced the barley. The 21 head while receiving whole feed gained 253 lbs., while receiving ground feeds fed separately 269 lbs., and while receiving ground feeds mixed 222 lbs. On the ground feeds fed separately 5 sheep made no gains, while on the mixed ground feeds 6 head gained from — 7 to 2 lbs. during the 90 days. On the whole feeds the wethers, with one exception, all made fair gains.

The results of an experiment in which three lots of hogs were fed during three successive periods of 30, 31, and 29 days each on rations of whole barley and whole alfalfa hay, ground barley and ground alfalfa fed separately, and ground barley and ground alfalfa mixed indicated that it pays to grind barley for hogs. On the first ration the hogs gained 385 lbs., on the second 793 lbs., and on the third 720 lbs. The difference in the amount of ground and whole hay consumed per 100 lbs. of gain was not significant, but there was a big difference in the requirements for ground and whole barley. Mixing the ground hay and barley did not increase the palatability of the ration or decrease the cost of gains.

In another experiment three lots of hogs were fed during three successive periods of 30, 34, and 28 days each on rations similar to the above, except that corn replaced the barley. In this study grinding the feed and feeding it separately increased the rate of gain, but also increased the feed and cost per unit of gain. Mixing the ground feeds did not increase the palatability of the ration nor decrease the cost of gains.

III. *Feeding ground roughages to dairy cows*, T. M. Olson (pp. 42–56).—Concluding this phase of the study (E. S. R., 63, p. 67), it was found that cows fed ground or cut roughages gained slightly in weight but consumed larger quantities of concentrates. More coarse roughages were eaten when they were cut and mixed with the concentrates. About 36 per cent of corn stover consisting of the lower 2 to 2.5 feet of the stalk was refused when the roughage was fed alone. The digestibility of the entire ration was not increased by mixing the cut or ground roughages with the concentrates, but a closer agreement in the coefficients of digestibility was obtained when fed in this manner than when the roughages were fed alone.

Cows required about twice as much time to eat whole roughage as they did for the same number of pounds of cut roughage. In chewing the cud more champs per bolus were made on the cut than on the whole roughage. There was no significant difference in the physical condition of the cows on the different roughages nor in the palatability of cut and whole corn stover. It is not considered advisable to cut or grind a good grade of roughage, and processing low-grade roughages depends upon the cost of grinding and the facilities for storing and feeding.

The effect of the curing process upon the vitamin A and D content of alfalfa, W. C. Russell (*Jour. Biol. Chem., 85 (1929), No. 1, pp. 289–297*).—Continuing this study (E. S. R., 63, p. 365) at the New Jersey Experiment Stations, it was found that alfalfa leaves from plants dried by artificial heat contained approximately seven times as much vitamin A as the leaves of plants cured in the field. The artificially dried samples were green as compared with the brownish-green color of the samples cured in the field. Only a small amount of vitamin D was found in the leaves of the artificially cured plants, whereas when the alfalfa was dried in the sun without exposure to rain or dew there was an increase in the vitamin D content of the leaves. This increase in vitamin D, however, was gained at the expense of the vitamin A content.

Commercial feeding stuffs, L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 309 (1930), pp. 39*).—This is the usual report (E. S. R., 62, p. 760) of the analysis for protein, fat, and fiber of 1,704 samples of feeding stuffs collected for official inspection during December, 1929. The brands fulfilling their guaranties and the status of brands failing to meet their guaranties are listed.

Beef cattle: Their feeding and management in the Corn Belt States, R. R. Snapp (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 2. ed., rev., pp. VIII+494, pl. 1, figs. 95*).—An enlarged and completely revised edition of this treatise, previously noted (E. S. R., 54, p. 859).

Beef calves make economical gains, G. A. Branaman and G. A. Brown (*Michigan Sta. Quart. Bul., 13 (1930), No. 1, pp. 25–27*).—Continuing these studies (E. S. R., 61, p. 858), 3 lots of 10 calves each, averaging approximately 379 lbs. per head, were fed for 190 days on a basal ration of linseed cake, corn silage, and alfalfa hay. In addition lot 1 received ground barley, lot 2 shelled corn, and lot 3 ground oats.

The average daily gains were 2.2, 2.08, and 2.04 lbs. per head in the respective lots. The calves in lot 1 gained faster on the same amount of feed and had a lower cost per 100 lbs. of gain than those in lot 2. However, the corn-fed calves were fatter at the end of the test, had a higher market value, and the pork produced in this lot was five times that produced in the barley lot. The calves fed oats gained slower on the same amount of feed and were not finished at the end of the test. These calves were valued considerably below the price of the corn-fed calves, and the pork credit in this lot was very small.

[Experiments with beef cattle at the North Dakota Station] (*North Dakota Sta. Bul. 233 (1930), pp. 30, 31, 42–44*).—The results of two experiments are briefly noted.

Shrinkage on steers, J. H. Shepperd.—Two carloads of steers shipped from Mandan, N. Dak., to South St. Paul, Minn., shrank 4.4 per cent after having a fill at the market, while one carload of similar steers shipped to West Fargo, N. Dak., shrank 8.3 per cent in weight without having had a chance to eat or drink.

Animal nutrition, F. W. Christensen.—Continuing these studies (E. S. R., 59, p. 864), 4 groups of 5 steers each, averaging 1,018 lbs. per head, were fed for 130 days on a basal ration of alfalfa hay and ground barley during 1927–28. Lot 1 received the basal ration only, lot 2 sweetclover silage carried over from the previous season, lot 3 sweetclover silage of the season's growth, and lot 4 corn silage and linseed meal. A portion of the barley in lot 4 was replaced by the linseed meal. The average daily gains in the respective lots were 1.55, 2.32, 2.24, and 2.17 lbs. per head, and the total feed consumed per pound of gain was 18.38, 17.62, 17.73, and 24.99 lbs. in the respective lots.

During 1928–29, 4 groups of 5 steers each, averaging 918 lbs. per head, were fed for 130 days. In this study alfalfa hay and linseed meal were fed to all groups, and the first 3 lots received a grain mixture of equal parts of ground barley and buckwheat. Lot 4 received ground barley alone. Lot 1 was fed sweetclover silage carried over from the previous year, lot 2 no silage, and lots 3 and 4 corn silage. The average daily gains in the respective lots were 2.37, 2.21, 2.53, and 2.58 lbs. per head, and the total feed consumed per pound of gain was 18.07, 12.48, 20.65, and 20.13 lbs. in the respective lots.

[Feeding experiments with beef cattle] (*Ohio Sta., Co. Expt. Farms Rpts. 1927, Madison Co. Farm, pp. 1, 2*).—A lot of steers receiving a ration of 33 lbs. of corn silage, 2.1 lbs. of clover hay, 2 lbs. of cottonseed meal, and 8.5 lbs. of shelled corn per head made an average daily gain of 2.58 lbs. A similar lot receiving 15 lbs. of silage, 1.3 lbs. of clover hay, 2 lbs. of cottonseed meal, and 24.9 lbs. of cut shocked corn, of which 10.2 lbs. was ear corn, gained 2.54 lbs. per head daily. Crediting the feed saved by the hogs following the steers, the return per steer over feed cost was $9.29 in lot 1 and $6.21 in lot 2.

[Feeding experiment with beef cattle] (*Ohio Sta., Co. Expt. Farms Rpts. 1928, Madison Co. Farm, pp. 1–3*).—To determine the value of ground oats as a partial substitute for shelled corn, two lots of 11 steers each, averaging approximately 732 lbs. per head, were fed for 140 days on a basal ration of corn silage and mixed hay. In addition lot 1 received shelled corn and 2 lbs. of linseed meal and lot 2 shelled corn and ground oats, equal parts, and 0.8 lb. of linseed meal per day. The average daily gains were 2.21 and 2.12 lbs. per head in the respective lots. The cost of 100 lbs. of gain was approximately $1 cheaper in lot 2 than in lot 1. After crediting the feed saved by the hogs the return per steer was $11.28 in lot 1 and $11.66 in lot 2.

Protein concentrates for yearling steers, P. Gerlaugh and P. Hackett (*Ohio Sta. Bimo. Bul. 146 (1930), pp. 131, 132*).—In this study 4 lots of 100 steers each, averaging approximately 670 lbs. per head, were fed for 174 days on a basal ration of ground ear corn, corn silage, and legume hay. In addition the respective lots received the following protein supplements: Linseed meal, cottonseed meal, whole soybeans, and a mixture of equal parts of the three.

The average daily gains were 2.14, 2.21, 2.13, and 2.23 lbs. per head in the respective lots. The cost of 100 lbs. of gain was cheapest in lot 2, followed in ascending order by lots 4, 3, and 1. The steers in lot 4 had the keenest appetites throughout the test and would have consumed more corn. No difficulties were encountered in any lot with steers going off feed.

Returns per acre in cattle feeding, Part II, P. Gerlaugh and H. W. Rogers (*Ohio Sta. Bimo. Bul. 146* (*1930*), *pp. 132–135*).—Continuing this study (E. S. R., 61, p. 665), two lots of 14 and 10 steers each, averaging 662 lbs. per head, were fed for 177 days. Lot 1 received a ration of corn silage, cottonseed meal, and mixed hay, while lot 2 received shelled corn, corn silage, cottonseed meal, mixed hay, and corn stover. The average daily gains in the respective lots were 2.11 and 2.51 lbs. per head.

Lot 1 produced 712 lbs. of beef and 28 lbs. of pork, and lot 2, 515 lbs. of beef and 66 lbs. of pork per acre of corn. An acre of corn fed as silage returned $56.66 as compared with a return of $57.06 from a similar acre fed as shelled corn and silage. Both lots yielded carcasses of desirable color and firmness.

Feeding low grade wheat to cattle and sheep, J. H. Shepperd and F. W. Christensen (*North Dakota Sta. Circ. 44* (*1930*), *pp. 10*).—A popular publication discussing the best methods of feeding wheat to cattle and sheep.

Breeding ewe lambs, D. J. Griswold (*North Dakota Sta. Bul. 233* (*1930*), *pp. 41, 42*).—Range-raised Hampshire-Rambouillet ewe lambs were divided into two lots of 122 head each in 1927. One lot had rams turned with them from December 8 to January 7 so that they would lamb at 14 months of age. Of the 122 ewes in the bred lot, 104 conceived and produced 105 lambs, 78 of which were alive at weaning time, October 3. The average birth weight of the lambs was 7.9 lbs., and the average weaning weight 68.1 lbs. At weaning time the open ewes averaged 119.8 lbs. per head, while the ewes that had raised lambs averaged 108.1 lbs. per head. The difference in weight was almost entirely due to condition.

In 1928 half of the open ewes were sold. Rams were turned with both lots on December 7. At this time the group of ewes that had raised lambs averaged 125.5 lbs. per head, and the ewes that had not raised lambs 135.6 lbs. per head. On April 8 the early-bred ewes averaged 142.1 lbs. per head and the late-bred ewes 148.5 lbs. The 121 ewes in the early-bred group produced 163 lambs in 1929, averaging 9.3 lbs. per head at birth, while the 59 ewes in the late-bred group produced 84 lambs, averaging 9.2 lbs. at birth. The average fleece weight in the early-bred group was 8.8 lbs. in 1928 and 8.4 lbs. in 1929, while the average fleece weight in the late-bred group was 9 and 9.2 lbs., respectively.

Karakul sheep, C. G. Potts (*U. S. Dept. Agr., Farmers' Bul. 1632* (*1930*), *pp.* [2]+*10, figs. 6*).—In this publication the characteristics and early history of Karakul sheep in the United States are discussed. The classes of lambskins, character and uses of Karakul wool, and characteristics of the meat are described. The results of experiments in grading up and crossbreeding for the development of ewes suitable for mating to purebred rams are reported.

Wool studies with Rambouillet sheep, II, F. S. Hultz and L. J. Paschal (*Wyoming Sta. Bul. 174* (*1930*), *pp. 31*).—Continuing this study (E. S. R., 57, p. 367), samples of wool were taken from the shoulder and thigh of each of 101 sheep shown at the International Livestock Exposition, Chicago, for three successive years. Each sample was taken from a skin area measuring 0.5 sq. in. by caliper measurement. The samples were evaluated according to the show placings of the animals and according to sex and age. The laboratory treatment was the same as in the previous test.

The shoulder fibers had a diameter of 0.000584 in., a density of 27,936 fibers per square inch, 17.2 crimps per inch, a staple length of 2.11 in. (corrected to 12 months' growth), and a stretched fiber length of 2.87 in. (12 months' growth). The corresponding measurements for the thigh samples were diameter 0.000677 in., density 22,492 fibers, 15.3 crimps, staple length 2.01 in., and fiber length 2.83 in. There was but little difference in the extremes of all samples, indicating a high degree of uniformity among the prize winners, and since the champions of either sex were not above the average in fleece characters it was assumed that factors other than fleece decided their placings.

Commercial mixed proteins for swine tested, G. A. Brown (*Michigan Sta. Quart. Bul., 13 (1930), No. 1, pp. 8–12*).—A series of four tests with fattening hogs showed that commercial mixed protein feeds increased the cost per unit of gain as compared with either tankage or skim milk. In two of the trials skim milk at 25 cts. per hundredweight was more efficient than tankage at $75 per ton, and the latter was more efficient than the commercial protein feeds. The higher cost per unit of gain in the lots receiving the commercial mixed protein supplements was largely due to the fact that the pigs consumed larger quantities of these feeds.

Pork production at the North Platte Substation, W. P. Snyder (*Nebraska Sta. Bul. 243 (1930), pp. 20*).—The results of several years' work at the North Platte Substation are summarized.

Protein supplements for dry-lot feeding.—Tankage as a sole supplement to corn in dry lot proved superior in a number of experiments to linseed meal in both rate and economy of gains. Cottonseed meal was inferior to tankage as a protein supplement to corn. Adding linseed meal to a corn and tankage ration increased the rate but not the feed required to produce a unit of gain, and in five trials the addition of cottonseed meal also increased the rate of gain. A supplement composed of two or three parts of cottonseed meal and one part of tankage produced the most efficient results for dry-lot feeding, and there were indications that the addition of a small amount of linseed meal still further improved the ration under these conditions. The principal rôle of linseed meal and cottonseed meal was to stimulate feed consumption, thereby increasing gains.

Protein supplements on alfalfa pasture.—The protein supplements alone and mixed produced better results in dry lot than on pasture. Adding tankage to a full feed of corn on alfalfa pasture increased the rate and economy of gains. Cottonseed meal added to corn increased the rate and economy of gains slightly over the corn-alone ration. Adding cottonseed meal or linseed meal, either free choice or in combination with tankage, made no improvement over the corn and tankage ration. A combination of linseed meal and tankage was less efficient than the cottonseed meal and tankage.

Alfalfa pasture v. dry lot for fattening spring pigs.—From an average of 7 trials, in which 136 pigs were fed in dry lot and a similar number on pasture, it was found that the pasture gains were consistently larger and the cost of gains was reduced almost 12 per cent through the use of pasture.

Spring v. fall pigs.—A comparison of similar spring and fall pigs fed like rations showed no significant differences in economy of gains, although the spring pigs made slightly larger gains.

Triplicate check lots—two years.—In this study the value of repeated trials with large numbers of experimental animals fed for periods of sufficient length for accurate results are clearly demonstrated. The results obtained in the study indicated that cottonseed meal was superior to linseed meal as a protein supplement for hogs. Cottonseed meal was fed at the rate of 15 per cent of the ration on alfalfa pasture; 13 per cent of the ration where tankage was 1 part, cottonseed meal 3 parts, and corn was fed in dry lot; and 11 per cent of the ration in dry lot with corn without any signs of cottonseed meal poisoning. This study shows that cottonseed meal may be safely fed as a part of the regular hog ration, that it is relished by hogs, and that there is little danger in feeding it where pigs have access to corn.

[Experiments with swine at the North Dakota Station] (*North Dakota Sta. Bul. 233* (*1930*), *pp. 31, 32, 130, 132, 133*).—The studies noted have been continued from previous years (E. S. R., 59, p. 867).

Production of Wiltshire sides, J. H. Shepperd and A. Severson.—During the period 1927–1928, 29 Yorkshire, 24 crossbred, 31 Duroc-Jersey, and 14 Chester White pigs were marketed, and their suitability for Wiltshire sides determined. The average number of sides suitable for export were as follows: Yorkshires 57.4 per cent, crossbreds 64.2, Duoc-Jerseys 55, and Chester Whites 42.9 per cent.

Hogging-off peas [*at the Hettinger Substation*], C. O. Plath.—On an acre basis, pigs gained 362 lbs. with some supplemental feed. The average daily gain over a 3-months feeding period was 1.5 lbs. per head. After deducting the cost of supplemental feed, each acre of ripe peas with a small amount of grass pasture returned $22.94.

[*Hogging-off peas at the Langdon Substation*], V. Sturlaugson.—In this study each acre of peas produced approximately 400 lbs. of pork. Attempts to hog off standing barley were unsuccessful.

[*Hogging-off trials at the Williston Substation*], E. G. Schollander.—During 1927 and 1928 each acre of field peas and flint corn produced an average of 463.7 lbs. of pork, and an average daily gain of 1.96 lbs. per head was obtained during the two seasons.

[Hogging-off peas and corn], E. G. Schollander (*North Dakota Sta. Bul. 235* (*1930*), *pp. 38–41, figs. 3*).—A plat containing 1.63 acres was planted on May 11 to a mixture of field and garden peas. On August 8 five pigs, averaging 107.6 lbs. per head, were turned in this field, and on August 12 four pigs, averaging 53 lbs. per head, were turned in. The garden peas were completely consumed before the pigs started eating the field peas, but all peas were consumed by September 4. The larger pigs made an average daily gain of 0.563 lb. per head during the 27 days on peas, while the smaller pigs gained at the rate of 0.565 lb. per head daily during the 23 days they were on peas.

The two lots of pigs were turned in a 1.39-acre plat containing Howes' Alberta and Gehu corn on September 4 and left there until October 5, when the corn was fully consumed. During the 31-day period the larger pigs made an average daily gain of 1.43 lbs. and the smaller pigs 1.27 lbs. per head. When the two periods were combined it was found that each acre produced an average of 167.8 lbs. of pork gain.

[Swine feeding studies] (*Ohio Sta., Co. Expt. Farms Rpts. 1927, Madison Co. Farm, p. 1; Miami Co. Farm, p. 1*).—Pigs at the Madison County Experiment Farm received a ration of corn supplemented with a mixture of tankage, linseed meal, and alfalfa meal 50:25:25 gained at the rate of 1.5 lbs. per head daily, and a gain of 1.33 lbs. was made by pigs receiving corn and tankage. The first lot required 455 lbs. of feed and the second lot 505 lbs. to produce 100 lbs. of grain. There was a difference of 50cts. in the cost of feed per 100 lbs. of grain in favor of the first lot.

The hog work at the Miami County Experiment Farm was similar to that above noted. The pigs ate 25 per cent more of the mixed supplement than of the straight tankage. The feed cost per 100 lbs. of gain was 11 cts. less when the mixture was fed.

[Hog feeding test] (*Ohio Sta., Co. Expt. Farms Rpts. 1928, Miami Co. Farm, pp. 2, 3*).—Two lots of 10 pigs each, averaging approximately 50 lbs. per head, were kept indoors on a concrete floor for 168 days and were fed a basal ration of corn and salt. In addition lot 1 received tankage and limestone, and lot 2, tankage, alfalfa meal, linseed meal, and limestone. The average daily gains were 0.85 and 0.98 lb. per head in the respective lots. Lot 2 required approximately 23 lbs. less feed per 100 lbs. of gain than lot 1 at a saving of 31 cts.

[Experiments with poultry at the North Dakota Station], O. A. Barton (*North Dakota Sta. Bull. 233 (1930), pp. 108–110*).—The results of several experiments, some of which have been continued (E. S. R., 59, p. 869), are briefly noted.

Yeast in ration of laying pullets.—In 1927–28 the check lot outweighed the yeast lot after the first two months, but the yeast lot came into production slightly earlier and the average egg production for the year was three eggs more per bird than in the check lot. The check lot consumed slightly more gain and less mash than the yeast lot. The eggs in the check lot cost about 0.5 ct. less per dozen than those in the yeast lot. Fertility and hatchability were higher in the check than in the yeast lot.

Dressing shrinkages.—Continuing this study (E. S. R., 59, p. 266), in 1928 it was found that the average dressing shrinkage of young turkeys was 9.62 per cent for females and 10.29 per cent for males. The respective drawing shrinkage percentages were 12.21 and 14.77. The total shrinkage from live weight to roaster preparation was 20.53 and 23.54 per cent for females and males, respectively.

Cost of wintering turkeys.—The average winter-feed cost from November 25, 1927, to April 25, 1928, of 13 turkeys, most of which were pullets, was slightly over 25 cts. per head per month. The average winter-feed cost from November 18, 1928, to May 18, 1929, of 19 turkeys of mixed ages was 22.65 cts. per head per month.

The feed cost of growing turkeys to 6 months of age.—In 1927 it cost 79 cts. per bird and slightly less than 8 cts. per pound of turkey produced to raise 33 pullets to 6 months of age. In 1928 the cost was 93.3 cts. per bird and 7.98 cts. per poung of turkey produced to raised 50 poults. It required 4.1 lbs. of feed to produce 1 lb. of turkey.

Comparison of initial weight and rate of growth of sexes.—The average hatching weights of 21 male and 29 female turkeys were 1.87 and 1.91 oz., respectively, and at 6 months of age the average weights were 15 lbs. 12.75 oz. and 9 lbs. 13.21 oz., respectively.

[Poultry feeding experiment] (*Ohio Sta., Co. Expt. Farms Rpts. 1928, Clermont Co. Farm, pp. 2–4*).—Pullets on a grain and mash ration produced 57 eggs from November 1 to March 1 and 184 eggs for 11 months, while the egg production of pullets on an all-mash ration was 56 and 177 eggs during similar periods. The birds on grain and mash consumed 81 lbs. of feed, and those on all-mash 75 lbs. Yearling hens on grain and mash produced 18 eggs from November 1 to March 1 and 115 eggs during 11 months, while similar hens on an all-mash ration produced 19 and 133 eggs, respectively. The grain and mash birds consumed 61 lbs. of feed and the all-mash birds 58 lbs.

A study of the comparative efficiency of various proteins in poultry feeding, C. W. Ackerson, M. J. Blish, and F. E. Mussehl (*Poultry Sci., 9 (1929–1930), No. 2, pp. 112–132*).—Continuing the study at the Nebraska Experiment Station (E. S. R., 60, p. 469) of the biological value of proteins for poultry, a comparison was made of the oviducts of pullets with those of hens after a 5-week period on a low nitrogen intake. The results showed that 95 per cent of the nitrogen ingested is lost from the oviduct by this manner of feeding.

The authors present arguments in favor of a fixed procedure for determining the biological values of proteins for hens. Tables showing comparisons of values obtained by the above procedure are presented for the proteins of corn, wheat, oats, rye, barley, and soybeans. The net protein of these grains in pounds per 100 lbs. of grain is also given in tabular form.

The utilization of the calcium of calcium carbonate and citrate by laying and non-laying pullets, W. C. RUSSELL and F. G. MCDONALD (*Jour. Biol. Chem., 84 (1929), No. 1, pp. 463–474*).—Calcium and phosphorus determinations were made during a 5-week period on 2 lots of 4 White Leghorn pullets each at the New Jersey Experiment Stations (E. S. R., 61, p. 763). Both lots received the same basal ration, but in lot 1 enough calcium carbonate and in lot 2 enough calcium citrate was added to bring the calcium content of the ration to 1.4 per cent. The phosphorus content of the rations was 0.34 per cent. Analyses were made of the excreta, the eggshells, and the egg contents.

It was evident from the negative or very slightly positive balances and from the lowered excretion of calcium in the droppings during egg production that the birds utilized the calcium from calcium citrate as well as from the calcium carbonate for egg formation. The positive balances that occurred during nonproduction indicated a retention of calcium for body needs. There was no difference in the breaking strength, grades, egg weights, and percentages of calcium in the shell of the two lots.

During egg production there was usually more phosphorus excreted than during nonproduction. This amount was more than that necessary to form tricalcium phosphate with the excretory calcium. These observations indicated a metabolic change involving phosphorus compounds during egg formation. During nonproduction the percentage of phosphorus retained was greater than that of calcium, and the phosphorus in the excreta was less than that required to form tricalcium phosphate. The ratio of calcium to phosphorus in the droppings was lower during egg production than during the nonlaying period.

Oats for layers, D. C. KENNARD (*Ohio Sta. Bimo. Bul. 146 (1930), pp. 152–154*).—Continuing this study (E. S. R., 63, p. 63), a lot of birds receiving a basal ration of ground corn, wheat, meat scrap, poultry bone, salt, cod-liver oil, oyster shells, and chopped alfalfa hay laid 45 eggs per bird from November 1 to March 1 and 76 eggs to June 1. A similar lot, in which 20 per cent of finely ground oats replaced a like amount of corn, laid 49 and 94 eggs, respectively. The feed consumption per bird for the 30 weeks was 33.5 lbs. in lot 1 and 36.3 lbs. in lot 2. The hatchability of fertile eggs set was 77 per cent in lot 1 and 83 per cent in lot 2. The birds receiving the oats weighed about 3 per cent more than those on the basal ration.

Some effects of pimiento pepper on poultry, W. L. BROWN (*Georgia Sta. Bul. 160 (1930), pp. 11, pl. 1*).—In this test 2 lots of White Leghorn hens and cocks were fed a basal ration of grain and mash, but in 1 lot 10 parts of the laying mash were supplemented with 1 part of ground dried ripe pimiento peppers. After 8 days of experimental feeding the eggs were saved for hatching. Chicks hatched from the 2 lots were divided into 4 lots, each lot containing chicks from the plain- and pimiento-fed hens. One of the lots received the basal ration only, while ground pimientos were fed in the ratio of 35:1, 22:1, and 10:1 in the other lots. At the end of 39 days the shank color and weight of each chick were determined.

In the group of hens fed the basal ration only, 348 eggs were set, of which 41 were infertile, and the hatching percentage of fertile eggs was 77.32. In the group fed pimientos 78 eggs were set, of which 7 were infertile, and 87.52 per cent of the fertile eggs hatched. All of the chicks from the pimiento group were strong at birth and 100 per cent were raised through 6 weeks, while in the other group there were several weak chicks and 94.23 per cent were raised through 6 weeks.

Pigment appeared in the shanks of the chicks from the pimiento eggs after from 5 to 6 days. At hatching time there was no visible difference in the color of the shanks of the chicks, and it is believed that as the unabsorbed yolk remaining in the chick is absorbed the color it contains is deposited in the shanks. At the end of the test chicks from pimiento eggs averaged more pigment in the shanks than those from the plain eggs, and with one exception cockerels averaged more pigment than pullets. As good gains in body weight were obtained with pimiento rations as with plain rations. Rations containing pimientos imparted a rich yellow color to the shanks, skin, and fat, the amount of color depending upon the amount of pimiento fed, but such feeding did not leave any pepper flavor in the meat.

The carotinoids xanthophyll and capsanthin are responsible for the pigmentation imparted by pimiento peppers.

Is the chief value of milk for feeding poultry due to the presence of a new vitamin? L. C. NORRIS, G. F. HEUSER, and H. S. WILGUS, JR. (*Poultry Sci., 9 (1929–30), No. 2, pp. 133–140, figs. 4*).—In a study at the New York Cornell Experiment Station, three lots of 30 White Leghorn chicks each were placed on the same basal ration and fed for a period of 12 weeks. A milk concentrate made by removing the fat, the casein, the lactalbumin, a considerable portion of the insoluble calcium phosphate, and the greater part of the milk sugar from milk was used to supplement the basal ration at the rate of 7.14 per cent in lot 1 and 2.68 per cent in lot 2. Lot 3 was used as a control. The above concentrate was as rich as yeast in vitamin B.

For the first 2 weeks the rate of growth was practically the same in all lots, but by the end of the third week lot 3 had fallen behind and never again equalled the other lots, although toward the close of the experiment this lot partially recovered and from then on developed at the same rate as the other lots. By the end of the fourth week lot 2 dropped behind lot 1 and remained there for the rest of the study. During the third week a weakness appeared in lot 3 characterized by great difficulty in the use of the legs. The birds frequently walked on their hocks with the toes curled and, in the advanced stages, the birds lay on the floor with legs sprawled out, and the leg muscles became flabby and withered. Attempts to cure severe cases by feeding yeast and the milk concentrate failed. In lot 2, two cases of paralysis occurred during the third and fourth week, but no lameness was evident in lot 1.

These results suggest that milk contains a factor, vitamin in nature, which is essential for preventing a peculiar type of feet and leg paralysis and indirectly influencing growth. It is suggested that the effects obtained from this factor have been credited to vitamin B.

The determination of the anti-rachitic properties of oat oil, L A. MUNRO and W. J. RAE (*Sci. Agr., 10 (1930), No. 5, pp. 305–312, figs. 6*).—A basal ration containing 2 per cent of corn oil was fed to 6 lots of 30 White Leghorn chicks each at the Manitoba Agricultural College. Lot 1 received the basal ration only, lot 2 had 1 per cent of the corn oil replaced by cod-liver oil, lot 3 all the corn oil replaced by oat oil, lot 4 the same as lot 3 except that the oat oil was irradiated with a quartz mercury lamp for 15 minutes at a distance of 2 ft., lot 5 the basal ration plus direct sunlight, and lot 6 had the dried skim milk of the basal ration replaced by a like amount of fish meal. The oat oil used had been kept in a sealed container for 1 year. The experiment extended over a period of 14 weeks.

A study of the growth curves, size of bones, X-ray photographs of joints, and ash determinations of the bones and blood showed that the oat oil used had no antirachitic properties either before or after irradiation. The fish meal decreased the rate of growth as compared with the other lots. Leg weakness became evident after 6 weeks' feeding in lots 1, 3, and 4 and after 8 weeks in lot 6, while no weakness appeared during the course of the experiment in lots 2 and 5.

Stearin from cod liver oil as a source of vitamin D, R. R. ROBERTS (*Poultry Sci., 9 (1929–30), No. 2, pp. 102–106*).—Continuing this study at the Indiana Experiment Station (E. S. R., 61, p. 365), three sets of experiments were conducted, using lots of 20 day-old chicks each. All lots received the same basal ration, and in addition cod-liver oil stearin, a by-product of medicinal cod-liver oil, was fed at levels of 0.5, 1, 2, and 4 per cent of the ration for a period of 8 weeks.

The cod-liver oil stearin prevented visible external signs of rickets in all chicks except those fed at the 0.5 per cent level, which was apparently not sufficient to prevent this disorder. However, the rate of growth of the chicks in this latter lot was practically the same as in the lot receiving 1 per cent of stearin. Rate of growth was not affected by feeding stearin at 1 and 2 per cent levels, but at the 4 per cent level growth was retarded to some extent. Since the mortality in the three experiments was quite low, it was evident that stearin had no harmful effect on the chicks.

Does the practical chick ration need iron and copper additions to insure normal hemoglobin building? E. B. HART, C. A. ELVEHJEM, A. R. KEMMERER, and J. G. HALPIN (*Poultry Sci., 9 (1929–30), No. 2, pp. 92–101*).—In a series of studies at the Wisconsin Experiment Station (E. S. R., 63, p. 64), day-old chicks were fed rations of varying composition. Some of the groups of chicks were kept in pens equipped with wire screen floors, while others were reared in pens bedded with shavings. The rations consisted of liquid skim milk and a grain mixture of varying composition supplemented with calcium carbonate and salt. All chicks were irradiated or fed cod-liver oil to prevent rickets, and the hemoglobin content of the blood was determined during the growing period.

Chicks fed milk and yellow corn on screen floors developed anemia during the early growing period, but the condition disappeared as the chicks grew older. Chicks fed the same diet but bedded with shavings did not develop anemia. When iron in the form of ferric chloride, beef liver, or lettuce ash was added to the diet of the chicks on the wire, anemia was prevented. The regular station baby chick ration when fed under practical conditions supplied enough copper and iron to prevent anemia. The addition of iron and copper salts did not increase the hemoglobin content of the blood nor the iron and copper content of the livers of the chicks when fed at the levels used in this study.

DAIRY FARMING—DAIRYING

Dietary factors influencing calcium assimilation, X–XIII (*Jour. Biol. Chem., 73 (1927), No. 1, pp. 59–68; 84 (1929), No. 1, pp. 359–365, 367–376; 86 (1930), No. 1, pp. 145–155*).—This series of studies at the Wisconsin Experiment Station has been continued (E. S. R., 57, p. 177).

X. *The influence of ultra-violet light upon calcium and phosphorus metabolism in milking cows,* E. B. Hart, H. Steenbock, H. Scott, and G. C. Humphrey.—In a metabolism experiment of 7 weeks' duration, 3 cows producing a liberal quantity of milk were fed in a darkened room for a period of 3 weeks and then each animal was irradiated for 1 hour daily with a quartz mercury vapor lamp at a distance of 22 in. above the back for a period of 4 weeks. From the results obtained it was evident that ultra-violet light had little if any effect on the calcium and phosphorus metabolism of dairy cows, no apparent influence upon the calcium and phosphorus content of the milk produced, and no influence upon the quantity produced. These results suggest that the cow derives its antirachitic vitamin from the feed.

XI. *The influence of cod liver oil upon calcium metabolism of milking cows*, E. B. Hart, H. Steenbock, E. C. Teut, and G. C. Humphrey.—In this study, lasting 5 weeks, 3 cows were fed the same basal ration, but 2 of them had 0.5 lb. of cod-liver oil added daily. The cod-liver oil used was tested with chicks and found to be quite potent in vitamin D. However, it showed no favorable influence on the calcium assimilation of these rather heavy milking cows. The oil was poorly, if at all, absorbed from the intestinal tract.

XII. *A study of the influence of hays cured with varying exposure to sunlight on the calcium metabolism of milking cows*, E. B. Hart, H. Steenbock, E. C. Teut, and G. C. Humphrey.—Concluding this phase of the study (E. S. R., 61, p. 168), it was found that alfalfa hays cured in Colorado were no more potent in vitamin D than alfalfa hays cured under the best sunning conditions in Wisconsin. While all of the hays studied had measurable antirachitic properties, none of them when fed at the level of 10 lbs. per head daily was able to maintain calcium equilibrium in a liberally milking cow.

XIII. *The influence of irradiated yeast on the calcium and phosphorus metabolism of milking cows*, E. B. Hart, H. Steenbock, O. L. Kline, and G. C. Humphrey.—In this metabolism study 3 cows were fed a basal ration of alfalfa hay, corn silage, grains, and grain products to which were added 200 gm. of nonirradiated yeast daily for a period of 4 weeks and then a like amount of yeast irradiated with a quartz mercury vapor lamp at a distance of 3 ft. for 2 hours for a similar period.

The irradiated yeast showed no positive evidence of improving the lime assimilation of these cows, although the vitamin D was absorbed into the blood. This absorption, however, did not change the calcium or inorganic phosphorus content of the blood nor were the calcium and phosphorus percentages in the milk changed by feeding irradiated yeast. When irradiated yeast was fed, milk production was well sustained over a period of 8 months, and there were no indications of any disturbed physiological functioning.

[Mineral feeding experiment with dairy cattle] (*Ohio Sta., Co. Expt. Farms Rpts. 1928, Trumbull Co. Farm, pp. 1, 2*).—Over a period of 6 years two lots of cows were fed similarly on hay, silage, grain, and pasture, but one lot had 2 per cent of dicalcium phosphate added to the ration. No direct effect on milk production could be traced to the mineral. During 41 lactations in the mineral group it required on the average 1.6 services per conception, while in the nonmineral group an average of 2.1 services per conception was required during 28 lactations.

Lactating dairy cattle need plenty of water, L. A. Moore and G. A. Bowling (*Michigan Sta. Quart. Bul., 13 (1930), No. 1, pp. 15–17, fig. 1*).—The water consumption of 10 lactating cows was measured by means of meters on the individual drinking cups over a period of 4 months. The water meters were read daily. The cows produced an average of 44 lbs. of milk daily and drank on the average 16.68 gal. of water. On this basis each cow drank 3.4 lbs. of water for each pound of milk produced. As the average daily temperature increased, the consumption of water increased and vice versa.

[Experiments with dairy cattle at the North Dakota Station], J. R. Dice (*North Dakota Sta. Bul. 233 (1930), pp. 56, 57*).—The results of three studies are noted.

Home-grown feed.—Continuing this study (E. S. R., 59, p. 872), 6 cows were fed through 3 20-day periods on a basal ration of alfalfa hay, corn silage, and a grain mixture of ground barley, ground oats, and ground corn 2:2:1. During the first and third periods 100 lbs. of linseed meal were added to this mixture, and during the second period 100 lbs. of No. 2 ground sweetclover seed. While receiving linseed meal the 6 cows produced an average of 167.74 lbs. of milk and 5.747 lbs. of butterfat per day, as compared with 171.23 lbs. of milk and 5.637 lbs. of butterfat while receiving ground sweetclover seed.

Potatoes for dairy cows.—A group of 6 cows was fed through 5 10-day periods preceded by 6-day transition periods on rations alternately containing raw potatoes and corn silage (E. S. R., 55, p. 570). While receiving potatoes the cows averaged 177.6 lbs. of milk and 5.335 lbs. of butterfat per day, and while on silage 169.9 lbs. of milk and 5.675 lbs. of butterfat per day. The potatoes were not quite as palatable and were more laxative than corn silage.

It was found impossible to produce "potato flavored" milk by feeding the cows potatoes. However, when milk and cream were stored for 2 hours at 55° F. in a potato cellar they developed a distinct potato flavor. Butter made from sweet cream produced by potato-fed cows was good in flavor and texture and compared favorably in flavor, body, and iodine number with butter made from the same cows when fed corn silage.

Shelter studies.—A group of cows kept out of doors during the winter with access to an open shed and allowed in the barn only at milking time were as persistent producers as cows kept in the barn and allowed out only for exercise.

Watering studies indicated that the number of times a day a cow was watered and the temperature of the water had little influence on milk or butterfat production. Cows receiving an adequate ration were able to withstand considerable exposure to dry, cold weather.

[Feeding experiments with dairy calves] (*Ohio Sta., Co. Expt. Farms. Rpts. 1927, Trumbull Co. Farm, pp. 1, 2*).—Four lots of calves received the following rations: Fresh whole milk, fresh separated milk, powdered skim milk remixed with water, and powdered skim milk fed after two months of age. In addition all lots received a grain mixture. The calves fed whole milk gained 1.6 lbs. per head per day, while those receiving dry milk gained 1.5 lbs. per day. The whole milk ration was the most expensive on the basis of cost of feed, and the separated milk the cheapest. When the labor of feeding was included in the cost, feeding dry skim milk was the cheapest method.

A suitable grain mixture for feeding with dry milk, and methods of starting animals on this feed are recommended.

Milk substitutes in the rearing of calves, J. B. ORR, A. CRICHTON, E. SHEARER, and M. SPEEDY (*Scot. Jour. Agr., 12 (1929), No. 2, pp. 168–174, fig. 1*).—In studies with calves at the Rowett Research Institute and the Edinburgh and East of Scotland College of Agriculture, Scotland, it was found that the addition of a protein and mineral mixture composed of blood meal, chalk, potassium chloride, steamed bone flour, sodium chloride, ferric oxide, and potassium iodide, together with cod-liver oil, improved an oatmeal and linseed cake ration for young calves. By use of the supplement the amount of whole milk required to rear a calf was reduced from 150 to 50 gal. The maximum beneficial effect of the supplement was noted with calves fed indoors during the winter, little benefit being derived from the supplement when the calves were on good pasture or by half-grown animals that had been on good pasture.

Normal day-to-day variability of yield of milk and fat of individual cows, S. BARTLETT (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 438–451*).—Based on the entire lactation records of 3 cows and on the monthly records of individual cows in a herd sampled at each milking for 3 consecutive days per month over a period of 5 years (E. S. R., 61, p. 264), the National Institute for Research in Dairying, University of Reading, England, studied individual variations in milk and fat yields from day to day.

The stage of lactation and the season of the year were found to affect the day-to-day variations in yield of milk and fat. During the first month of lactation the variations were high, particularly the first few days after weaning the calf, but afterwards a fairly constant variation could be expected. Under southern England conditions the variability was highest during the month of May and tended to be higher in summer than in winter. Less variation in milk yield obtained in 24 hours was found with cows milked twice daily at unequal intervals if the morning milk was added to the subsequent evening milk than if the evening milk was added to the subsequent morning milk.

A method is presented for calculating the variability in the yield of mixed milk from a herd and the error expected when the milk and fat records of individual cows are calculated from a few samples.

The effect on lactation of the length of the preceding calving interval and its relation to milking capacity, to age, and to other factors of influence, J. Matson (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 553–562*).—Based on observations extending over a period of 25 years at the Army Dairy Farms, Jubbulpore, India, the author found that a calving interval of somewhat less than a year gave the best results in the following lactation period for cows producing about 3,500 lbs. of milk annually. However, for cows producing 6,000 lbs. of milk a calving interval of 420 days was desirable, and one of less than 335 days was seriously injurious. Studies of individual cows and their records suggested that the calving intervals should be longer in early lactations than in later ones and progressively longer as the ability to produce milk increased. No relationship was found between length of calving interval and daily or weekly milk yield during the same lactation period. Permitting the bull to run with the cows often prevented the finding of the real producing ability of a cow.

The following law is suggested regarding the calving interval: "The optimum calving interval varies directly with milking capacity and inversely with age up to maturity."

The inorganic constituents of milk, N. C. Wright and J. Papish (*Science, 69 (1929), No. 1777, p. 78*).—In samples of milk collected in various parts of the United States and Great Britain, the authors were able to identify by means of spectrographic analyses the following elements not previously identified: Silicon, boron, titanium, vanadium, rubidium, lithium, and strontium. These elements were present in small but definite traces.

Variation in the composition of the milk of an abnormal cow, H. T. Cranfield and E. R. Ling (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 491–499, figs. 2*).—At the Midland Agricultural College, England, analyses were made of the composition of the milk of an abnormal cow over a period extending into three lactation periods. The fat content of the milk was quite variable, but the solids-not-fat content was consistently low. Protein and lactose contents were below the averages for normal milk. While the percentage of total ash was normal, the soluble portion was quite high, indicating a high chloride content, and the insoluble part correspondingly low. The phosphoric acid and lime percentages were lower than the mean for normal milk. There was a marked negative correlation between the lactose and the soluble ash content. The analyses suggested that the abnormally low solids-not-fat and the abnormal percentages of ash constituents might be an indication of an incipient disease affecting the milk-secreting organs. The cow was later found to be suffering from tuberculosis of the lungs and udder, but tuberculin tests during the first two lactation periods failed to show positive reactions.

When a "nonmineralized" cake was fed for a short period, followed by a "mineralized" cake for a similar period, no apparent change was produced in the composition of the milk. However, when varying percentages of protein were fed, followed by grass feeding, a temporary improvement in the quality of the milk occurred. Such feeding did not otherwise affect the composition of the milk.

Studies on the bacteriological content and keeping quality of milk, S. B. THOMAS and J. LEWIS (*Welsh Jour. Agr., 4 (1928), pp. 147–157*).—Based on the bacteriological examination of 908 samples of milk collected from 141 farms, the University College, Aberystwyth, Wales, determined that a gradual fall in the keeping quality of milk occurred as the bacteriological count increased. The presence of *Bacillus coli* had a deleterious effect on the keeping quality. In only 57 per cent of the samples examined were coliform organisms found.

The keeping quality decreased 24 hours with an increase of 10° F. in temperature during shipping. A difference of 18 hours in keeping quality could be accounted for by variations in personal efficiency during milking alone. Personal efficiency and method of production had more influence on bacterial counts and keeping quality than buildings or equipment. The bacteriological standard set for grade A milk could be easily attained by farmers with herds of 12 head or less.

Electrostatic studies in agricultural bacteriology, C. I. NELSON (*North Dakota Sta. Bul. 233 (1930), p. 45*).—The reduction time of Janus green B in 157 samples of milk was, with one exception, greater than the reduction time of methylene blue, and in the case of the exception the reduction time was the same. The differences varied from an average of 35 minutes in milks reducing methylene blue in less than 1 hour to an average of 83 minutes in milks reducing methylene blue in 6 hours or more. The difference in potential range over which the two dyes reduce and the marked poisoning action of the Janus green B account for these variations. The end point of reduction of Janus green B in milk was more marked than that of methylene blue. The rate of diffusion of atmospheric oxygen into tubes of whole milk was not rapid enough to have a measurable effect on the reduction time of methylene blue, Janus green B, or litmus. It was concluded that Janus green B had no advantage over methylene blue as an indicator of quality in milk, but several disadvantages.

The effect of heat on milk: (A) On the coagulability by rennet; (B) on the nitrogen, phosphorus, and calcium content, E. C. V. MATTICK and H. S. HALLETT (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 452–462, figs. 2*).—In studies at the National Institute for Research in Dairying, University of Reading, England, it was found that milk which had been heated to temperatures varying from 105 to 209° F. for 30 minutes differed from raw milk in its reaction to rennet in all cases. Heating as above did not change the diffusibility of the nitrogenous substances. However, heating to 175° and above appeared to decrease the diffusibility of the phosphorus content, while heating to 125° or more caused a marked decrease in the diffusibility of the calcium content of the milk.

The bacterial count in pasteurised milk, T. S. KEITH (*Med. Officer, 43 (1930), No. 23, pp. 255, 256, figs. 3*).—Studies in England have shown that the ordinary methods of collecting samples of bulk milk are not accurate for bacterial analyses. By means of pipettes of different lengths, samples were simultaneously drawn from different levels in a can. The bacterial analyses of these samples showed that the bacterial counts increased with the height from the bottom of the can. Based on these differences a method for collecting a fair sample from such containers was worked out and is described in this article.

The action of viscogen (calcium saccharate) on milk and cream, G. T. Pyne (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 463–471*).—A study of the mechanism by which viscogen (calcium saccharate) increases the viscosity of milk and cream was made at University College, Cork, Ireland. The initial reaction of viscogen seemed to be the formation of a precipitate of tricalcium phosphate which carried down considerable quantities of casein. This reaction was the most important single factor affecting viscosity. The casein was not directly precipitated by viscogen, but the viscosity of its solutions was increased slightly by the higher alkalinity of this reagent. The importance of this action of viscogen on the viscosity of milk or cream is relatively small.

Controlling the composition of butter, G. M. Trout and J. M. Jensen (*Michigan Sta. Quart. Bul., 13 (1930), No. 1, pp. 27–29*).—A formula for controlling the composition of butter, $c-a=w$, in which c equals the calculated butter yield, a the actual pounds of butter in the churn when the first moisture test was taken, and w the pounds of water necessary to bring the moisture content up to the desired standard, was tested by analyzing 13 churnings in which the moisture added was calculated according to the above formula. The average composition was fat 80.21 per cent, water 16.007 per cent, salt 2.91 per cent, and curd 0.855 per cent, while the composition desired was 80, 16, 3, and 1 per cent, respectively.

Cheese making, J. L. Sammis (*Madison, Wis.: Cheese Maker Book Co., 1930, 8. ed., rev. and enl., pp. 293, figs. 100*).—This is a revised edition of the treatise previously noted (E. S. R., 52, p. 279).

Proceedings of the twenty-second annual convention of the International Association of Milk Dealers: Laboratory section (*Internatl. Assoc. Milk Dealers, Proc., 22 (1929), Lab. Sect., pp. 111, figs. 24*).—At this meeting held in Toronto, Canada, October 24–26, 1929, the following papers were presented: Thermophiles in Pasteurized Milk and Their Relation to Certain Types of Equipment, by R. S. Breed (pp. 5–33); Microbiological Control in Creamery Butter, by D. G. Hood (pp. 33–39); Chlorine Sterilization in the Market Milk Field, by A. J. Powers (pp. 39–84); Effect of Heat Treatment of Skim Milk on the Stability and Viscosity of Cultured Buttermilk, by R. W. Bell and L. A. Burkey (pp. 84–90); Factors which Affect the Viscosity and Stability of Cultured Buttermilk, by R. W. Bell (p. 90); Significance of *Bacterium coli* in Milk and Milk Products, by W. H. Price (pp. 91–98); and The Identification and Significance of Hemolytic Streptococci (pp. 98–105) and Agglutination Tests for the Diagnosis of *B. abortus* Infection (pp. 106–111), both by J. G. Hardenbergh.

VETERINARY MEDICINE

Textbook of comparative general pathology, T. Kitt (*Lehrbuch der Allgemeinen Pathologie für Tierärzte und Studierende der Tiermedizin. Stuttgart: Ferdinand Enke, 1929, 6. ed., rev., pp. XII+570, pls. 4, figs. 213*).—A new edition of a work which first appeared in 1904 (E. S. R., 16, p. 821), with an English translation by W. W. Cadbury in 1906 (E. S. R., 18, p. 577).

Recent advances in tropical medicine, L. Rogers (*London: J. & A. Churchill, 1929, 2. ed., pp. X+439, figs. 16*).—This work includes data on the relation of insects and other animal parasites to tropical diseases, reviews the advance of knowledge of undulant fever, etc.

A text book of pharmacognosy, H. W. Youngken (*Philadelphia: P. Blakiston's Son & Co., 1930, 3. ed., rev. and enl., pp. XIII+817, figs. 367*).—Part 1 (pp. 1–47) is devoted to a morphologic consideration, and part 2 (pp. 49–772) to a taxonomic consideration, of drugs.

The Australian handbook of meat inspection, J. Johnston (*Melbourne: Modern Ptg. Co., 1929, [2. ed., rev. and enl.], pp. 248, pl. 1, figs. 73*).—This is the second edition of a work prepared for use by meat inspectors in Australia.

[Report of work in comparative pathology at the North Dakota Station], A. F. Schalk (*North Dakota Sta. Bul. 233 (1930), pp. 117–123*).—In attempting to determine the longevity of the avian germ in the soil tuberculous organs from fowls and cultures were buried at different depths in Red River soil. Removed at periods ranging from 3 to 30 months and processed by the antiformin method, the germs proved viable from all depths buried up to 9 months, after which they began to fail in viability in the more superficial burials down to 1 ft. depth. However, living, viable germs were recovered in some carcasses from 1 to 3 ft. depth burial after 17 and 21 months, and material was obtained from the remains of one carcass 3 ft. deep after 24-months burial. All efforts to recover the organism after 27- and 30-months burial, respectively, failed. In an experimental tuberculosis barnyard carefully checked experiments indicated that the avian germ remained alive and viable for at least 20 months, passing through two winters and one summer. These findings were based upon intravenous injections into nonreacting chickens.

In sensitization experiments with bovine tuberculosis, 15 of 48 animals inoculated became sensitized to mammalian tuberculins and 20 of 48 animals inoculated also became sensitized to avian tuberculin. Thirteen of the 15 mammalian tuberculin reacting cattle also reacted positively to avian tuberculin one or more times, but the most of these avian reactions were of a transient and temporary nature. Six of the mammalian positive reacting animals showed no visible lesions of tuberculosis at autopsy. Five of the 6 no-lesion animals had ceased to react to mammalian tuberculins from 1 to 7 months previous to autopsy. Nine of the mammalian reacting animals presented visible lesions of tuberculosis at autopsy, 8 of which were quite consistent monthly reactors to mammalian tuberculins. Of the animals sensitized with avian virus practically none reacted to the mammalian tuberculins, but in animals sensitized with the bovine virus more reacted to the avian tuberculin than to the mammalian products.

In a study of the infectiousness of blood from tuberculous chickens, it was found that 44 per cent of 48 fowls that presented visible lesions of the disease possessed a sufficient number of tuberculosis germs in 10 cc. of their blood to reproduce the disease in normal healthy fowls when introduced intraperitoneally.

In experimental feeding of cattle with potato sprouts none of the animals gave any evidence whatever of toxic symptoms from possible poison properties.

Experimental work with sweetclover, reported upon by L. M. Roderick, is incorporated in the report (pp. 119–123). In studying the effect of age on the toxicity of sweetclover, both the sample of hay obtained a year previously and one kept in the mow two years showed no evident diminution in toxicity. Attempts to spoil clean, bright sweetclover hay experimentally by wetting and molding failed in that no toxic or dangerous hay was produced. Similarly, two attempts to spoil sweetclover silage failed. Little difficulty was encountered, however, in securing a small quantity of toxic material if sweetclover is piled in a heap when incompletely and insufficiently cured. These results suggest that the sweetclover acquires the disease-producing properties in the curing process, and indicate that subsequent wetting and molding of a stack of cured sweetclover hay will not likely result in producing toxic properties.

In two of seven experiments in which rabbits were fed upon hay that had been sterilized for 1 hour at 15 lbs. steam pressure the disease was produced, although the time was prolonged to about 2 months. It is pointed out that while the toxic principle was considerably weakened the results lend further support to the assumption that this is not an infectious disease. No success was met with in the attempt to extract the toxic principle of the hay with water nor with alcohol. In treatment the administration of arsenic, iron, and traces of copper did not appear to cause any appreciable delay in the onset of hemorrhage in feeding trials with damaged sweetclover. This is considered further to substantiate the conclusion that the disease is one of hemorrhage rather than of deficient blood replacement and repair.

Feeding experiments with sheep demonstrated that if they are fed exclusively on toxic sweetclover hay losses may occur, although field losses in sheep from the fatal hemorrhage have not come to the station's immediate attention. Miscellaneous cattle feeding experiments with damaged sweetclover are noted, and brief reference is made to the functional pathology of sweetclover disease. Two feeding experiments conclusively demonstrated that the feeding of the damaged hay is particularly hazardous for pregnant cows, and it was shown that the characteristic alterations are produced in the unborn calf.

Annual report of the Veterinary Department, Northern Provinces, for the year 1928, W. W. HENDERSON ET AL. (*North. Provs. [Nigeria] Vet. Dept. Ann. Rpt. 1928, pp. 54, pls. 8*).—A large part of this annual report (E. S. R., 60, p. 868) deals with infectious diseases of livestock, particularly rinderpest and antirinderpest serum production in the field.

[Contributions on parasites and diseases of livestock and means for their control] (*Union So. Africa Dept. Agr., Pan-African Agr. and Vet. Conf., Pretoria, 1929, Papers, Vet. Sect., pp. 319, figs. 17; Rpt. Proc., pp. 149–200*).—The following contributions relating to diseases of livestock presented at the Pan-African Agricultural and Veterinary Conference held at Pretoria in August, 1929, are included in the report of the veterinary section: Trypanosomiasis, by H. E. Hornby (pp. 7–9); Camel Trypanosomiasis in the Sudan, by S. C. J. Bennett (pp. 10–15); Some Aspects of the Tsetse Fly Problem in a Colony Developing on the Basis of European Settlement, by R. W. Jack (pp. 16–22); Essay on the Economic Possibilities of the Treatment of Trypanosomiasis in Cattle (Bovines) Working within Areas Affected by Glossina, by J. Pereira Martinho (pp. 22-37); Rinderpest Research in Kenya, by J. Walker (pp. 39-57); Prophylactic Vaccination against Rinderpest, by R. Daubney (pp. 57–85); Specific Ophthalmia of Cattle, by J. D. W. A. Coles (pp. 86–89); A Hypothesis Concerning the Etiology of "Stiff-Sickness," by C. S. Cruz (pp. 89–93); Epizootology of Worm Infection (with Special Reference to Worms of Domestic Animals), by H. O. Mönnig (pp. 94–101); The Prevention and Treatment of Fascioliasis in Cattle (pp. 101–107), Onchocerciasis of Cattle, with Special Reference to Its Possible Life-Cycle and Control (pp. 107–112), and A Brief Review of the Literature Dealing with the Kidney Worm (*Stephanurus dentatus* Diesing, 1839) of Swine, together with Suggestions for Its Control and Ultimate Eradication (pp. 112–118), all by P. L. le Roux; Contagious Bovine Pleuro-pneumonia—Culture Vaccines, by S. C. J. Bennett (pp. 118–123); Pleuro-pneumonia Contagiosa Bovum, by J. Walker (pp. 123–144); The East Coast Fever Problem in the Union, by P. R. Viljoen (pp. 145–157); Artificial Immunization and Immunity in Their Relation to the Control of East Coast Fever, by J. Walker and S. H.

Whitworth (pp. 158–171); Piroplasmic Infections of Cattle in Egypt, by M. Carpano (pp. 172, 173); Contagious Pleuro-pneumonia of Goats in East Africa, by R. W. M. Mettam (pp. 173–178); Poultry Diseases in South Africa, by G. Martinaglia (pp. 178–187); Hemoprotozoal Infections (Spirochaetosis and Piroplasmosis) of Poultry in Egypt, by M. Carpano (p. 187); The Veterinary Service in Cameroon (pp. 188–192) and Veterinary Legislation in Madagascar (pp. 193–197), both by H. Poisson; Black-Quarter and Allied Anaerobic Diseases in South Africa, by J. R. Scheuber (pp. 197–204); Botulism in the Domesticated Animals in South Africa, by E. M. Robinson (pp. 204–213); Sheep Scab, by F. A. Verney (pp. 214–218); The Scab Problem in the Union, by P. R. Viljoen (pp. 219–225); Goat Skins and the Conditions Which Detrimentally Affect Their Economic Value, by W. W. Henderson (pp. 225–234); Poisonous Plants in South Africa Hitherto Unknown, by D. G. Steyn (pp. 234–246); The Tenacity of the Virus of Foot-and-Mouth Disease under Field Conditions, by R. Jockson (pp. 246–251); Memorandum on Horse-Sickness Immunization, by S. H. Whitworth (pp. 251–259); Horsesickness in Egypt and Eritrea, by M. Carpano (pp. 260, 261); Memorandum on Research on East African Swine Fever Immunization in Kenya, by J. Walker (pp. 262–272); Rabies in South Africa, by P. J. du Toit (pp. 272–284); Rabies in Burma, by D. T. Mitchell (pp. 284, 285); A Grave Sickness in Dogs in Egypt; Sickness Very Similar to Rabies, by M. Carpano (pp. 285, 286); Veterinary Problems in Native Areas, by P. R. Viljoen (pp. 286–290); Veterinary Problems of the African Native, by J. Smith (pp. 290–292); Veterinary Education, with Particular Reference to State Services in the Tropics, by R. Daubney and R. W. M. Mettam (pp. 293–300); Veterinary Education in Madagascar, by H. Poisson (pp. 300–304); Veterinary Education of Natives, by A. G. Doherty (pp. 305, 306); The Spleen in Ruminants and Equines, Mainly a Review on the Sequelae of Splenectomy, by G. de Kock (pp. 306–312); Veterinary Research Organizations in Great Britain, including the New Bureau of Animal Health, as Available for Empire Purposes (pp. 313–315) and Foot-and-Mouth Disease (pp. 316–319), both by W. H. Andrews.

The discussions of these subjects are included in the report of the proceedings.

The longevity of dry spores of B. anthracis, G. S. Graham-Smith (*Jour. Hyg. [London], 30 (1930), No. 2, pp. 213–215*).—The author finds that if spores of *B[acillus] anthracis* are kept dry at room temperature and exposed to diffuse daylight about 50 per cent seem to be incapable of germinating within a few months. Of the remainder, a considerable proportion is capable of germinating for 10 years. Subsequently the proportion of living spores decreases, until all seem to be dead in about 23 years.

Cultivation and classification of "bacteroides," "symbionts," or "rickettsiae" of Blattella germanica, R. W. Glaser (*Jour. Expt. Med., 51 (1930), No. 6, pp. 903–907*).—The author finds that with *B. germanica* bacteriocytes are found in all individuals of both sexes. These bacteriocytes are scattered throughout the fat tissue and their cytoplasm is filled with microorganisms. Evidence is presented to show that the intracellular parasites are diphtheroidal bacilli. These diphtheroids are transmitted from one generation to another through the ova.

Brucella abortus in certified milk, D. E. Hasley (*Jour. Infect. Diseases, 46 (1930), No. 5, pp. 430–434*).—The results of investigations conducted in the city of Detroit show that it is possible to detect *B. abortus* in certified milk by plating methods. *B. abortus* was grown from 10 of 230 samples examined. The 10 positive samples were obtained from 3 of the 5 dairies studied. The highest number of organisms found in these samples was 8 per cubic centimeter of milk and their average 2 per cubic centimeter.

Brucella abortus agglutinins in porcine blood, R. A. Boak and C. M. Carpenter (*Jour. Infect. Diseases, 46 (1930), No. 5, pp. 425–429*).—Agglutination tests for *B. abortus* agglutinins on 4,014 serums from porcine blood samples collected from New York and seven midwestern States showed 64, or 1.5 per cent, to be positive. The percentage of agglutination for 1,054 samples from New York was 0.19, while 1.89 per cent of 2,735 samples from Ohio, Illinois, Indiana, and Missouri were positive.

The chemotherapy of infectious abortion of the bovine [trans. title], R. Moussu and P. Courtehoux (*Rec. Méd. Vét., 106 (1930), No. 4, pp. 185–189*).—It is concluded that the administration of gonacrine and of mercurochrome is of no value in the treatment of infectious abortion in the bovine, thus differing from the results with gonacrine in undulant fever in man.

The udder as a reservoir of Br. melitensis (abortus) infection of cattle, C. A. Mitchell and R. C. Duthie (*Canad. Jour. Research, 2 (1930), No. 6, pp. 403–405*).—This is a contribution from the Animal Diseases Research Institute, Dominion Department of Agriculture. The removal of the udders from two cows known to be infected with *Brucella melitensis* (*abortus*) was followed in both cases by a reduction in agglutination titer. In one the agglutination titer declined from 1:600 to a value within the negative range, 1:25, and in the other the very high agglutination titer, 1:28,000, rapidly declined to a point just within the positive range, 1:100.

A simple mineral mixture agar for the cultivation of Pasteurella boviseptica, J. P. Scott (*Jour. Bact., 20 (1930), No. 1, pp. 9–14*).—In reporting upon work conducted at the Kansas Experiment Station the author deals with the growth of *P. boviseptica* on agar containing different concentrations of six mineral salts, the optimum concentration of each salt having been determined. A mineral mixture agar is described which increases the growth, viability, and pathogenicity of *P. boviseptica*. The viability of cultures of *P. boviseptica* is prolonged by storage at room temperature instead of at an ice box temperature of 50° C. or less. A sugar-free mineral mixture medium for the differentiation of *P. boviseptica* from related organisms is described.

Trypanosomes in the blood of Victorian animals, A. W. Turner and D. Murnane (*Jour. Council Sci. and Indus. Research* [*Aust.*], *3 (1930), No. 2, pp. 120–122, pls. 2*).—The first of the two papers here presented is entitled A Preliminary Note on the Occurrence of *Trypanosoma theileri* in the Blood of Cattle (pp. 120, 121), and the second On the Presence of *Trypanosoma melophagium* in the Blood of Victorian Sheep and Its Transmission by the Sheep "Tick" *Melophagus ovinus* (pp. 121, 122).

A preliminary note on the occurrence of Trypanosoma theileri in the blood of cattle in Victoria, A. W. Turner and D. Murnane (*Aust. Jour. Expt. Biol. and Med. Sci., 7 (1930), No. 1–2, pp. 9–11, pl. 1*).—The authors report the discovery of *T. theileri* in defibrinated ox blood collected at abattoirs, this being the first record of its discovery in Australia.

Note on tubercle bacilli of avian origin harbored in the udder of a cow, C. A. Mitchell and R. C. Duthie (*Canad. Jour. Research, 2 (1930), No. 6, pp. 406–408*).—This is a contribution from the Animal Diseases Research Institute, Dominion Department of Agriculture. The tubercle bacillus, isolated from an avian source, the common crow, in the studies previously noted (E. S. R., 62, p. 377), remained alive in the udder tissue of a cow 210 days after intravenous inoculation without producing demonstrable macroscopic lesion. Reinoculated from the udder tissues into laboratory animals, it proved virulent and caused progressive lesions in chickens and rabbits but not in guinea pigs.

Experiences from many years' fight against bovine tuberculosis, B. Bang (*Vet. Rec., 10 (1930), No. 26, pp. 557–562*).—A discussion of bovine tuberculosis control based upon an experience extending over 38 years.

Actinomycosis of the mammary gland of cows in Victoria, H. E. Albiston (*Aust. Vet. Jour., 6 (1930), No. 1, pp. 2–22, pls. 6*).—Twenty-six cases of clinical actinomycosis of the udder were examined, and in each case the causal organism was found to be *Staphylococcus pyogenes*. The diagnosis was confirmed histologically and in 17 instances by culture. In 2 cases the supramammary lymph glands were found to be infected with staphylococcic actinomycosis. A review is given of the literature, a study of which shows that true actinomycosis (infection with streptothrices) of the udder must be very rare. The possible methods of infection are discussed, and a short note is included on several pathological conditions simulating mammary actinomycosis on ante mortem examination.

Cattle plague in Egypt, I. F. Salem (*Egypt Min. Agr., Tech., and Sci. Serv. Bul. 88 (1930), pp. 32*).—A summary of information on rinderpest, the most important animal disease occurring in Egypt, the nature and infectivity of the virus, and immunization.

A contribution to the epidemiology of specific infectious cystitis and pyelonephritis of cows, F. S. Jones and R. B. Little (*Jour. Expt. Med., 51 (1930), No. 6, pp. 909–920, pls. 2*).—Bacteriological examination of the genitourinary tract of calves originating in a herd in which infectious cystitis and pyelonephritis occurred among the cows revealed a variety of cultural types of diphtheroids. Of these types, one obtained from a considerable number of the calves resembled in morphology and cultural characters the organism cultivated from the actual cases of the disease. This group had agglutination affinities like those of the organism mentioned and was capable of absorbing agglutinin from antiserum specific for it. When three cows were inoculated intraurethrally with cultures isolated from the sheaths of calves, two developed transient infections and the other a severe prolonged cystitis and pyelonephritis.

Black disease (infectious necrotic hepatitis) of sheep in Australia, A. W. Turner (*Jour. Council Sci. and Indus. Research [Aust.], 3 (1930), No. 2, pp. 117–120*).—This is a brief account of the recent successful work with black disease of sheep conducted by the Council for Scientific and Industrial Research, under the direction of the author, in continuation of the progress report previously noted (E. S. R., 62, p. 669). The causal organism of the disease has been identified as a race of *Bacillus oedematiens*. "The association of the disease with liver fluke, first insisted upon by Dodd [E. S. R., 45, p. 685], has been amply confirmed. Definite information that it is insidiously spreading has been accumulated, and it has been shown to be spread by the movements of flocks from affected to 'clean' farms."

Milk fever in sheep [trans. title], **E. Noordijk** (*Tijdschr. Diergeneesk., 57 (1930), No. 2, pp. 689, 690; Ger., Eng., Fr. abs., p. 690*).—Cases of milk fever in sheep have been observed repeatedly by the author. Compared with the bovine, insufflation of the udder as a remedy was found less effective. The application of Sjollema's treatment (E. S. R., 61, p. 270), in which from 3 to 6 gm. of calcium chloride and from 4 to 8 gm. of glucose were injected intravenously, gave strikingly good and rapid results.

A survey of the helminth parasites of swine in New South Wales, G. Kauzal (*Aust. Vet. Jour., 6 (1930) No. 2, pp. 51–56*).—A survey made of the helminth parasites of swine in coastal districts of New South Wales showed the highest incidence with the following parasites: *Stephanurus dentatus*, *Ascaris lumbricoides*, *Oesophagostomum dentatum*, and *Metastrongylus apri*. With the exception of *S. dentatus*, infestation with the other parasites mentioned was generally so light that little pathogenic importance could be attributed to their presence. The incidence of *S. dentatus* infestation was high on the north coast, but it was not found on the south coast. A high percentage of liver and lung lesions was associated with this parasite. *Hyostrongylus rubidus*, *O. longicaudum*, *Choerostrongylus pudendotectus*, and *Physocephalus sexalatus* are recorded from the pig in Australia for the first time.

The examination of horses for soundness, A. D. G. MacGregor (*Calcutta: Thacker, Spink & Co., 1929, pp. [XI]+172, pls.* [7], *figs. 42*).—A treatise designed to aid in the proper and thorough examination of horses for soundness and health.

The common colics of the horse, their causes, symptoms, diagnosis, and treatment, H. C. Reeks (*London: Baillière, Tindall & Cox, 1927, 4. ed., pp. XVIII+403, figs. 32*).—A revised edition of the work previously noted (E. S. R., 32, p. 584).

"Grass-disease," S. H. Gaiger (*Yorkshire Agr. Soc. Trans., 87* (*1929*), *pp. 29–38*).—An account of a disease which continues to take a heavy toll annually among horses in Great Britain. It is pointed out that the causative agent has not as yet been determined.

Handbook of poultry diseases and poultry breeding, edited by T. van Heelsbergen (*Handbuch der Geflügelkrankheiten und der Geflügelzucht. Stuttgart: Ferdinand Enke, 1929, pp. XXIII+608, pl. 1, figs. 350*).—This work deals with the subject as follows: Anatomy and Physiology of Fowls (pp. 1–34) and Post-Mortem Technic (pp. 35–39), both by H. A. Vermeulen; Poultry Feeding (pp. 40–53), Diseases Due to Food Deficiency and Deranged Metabolism (pp. 54–66), and Breeding and Rearing (pp. 67–89), all by G. M. v. d. Plank; Hygiene, by B. J. C. te Hennepe (pp. 90–103); Infectious Diseases, by T. van Heelsbergen (pp. 104–329); Diseases Due to Protozoa (pp. 330–373) and Diseases Due to Spirochetes (pp. 374–382), both by B. J. Krijgsman; Parasitic Diseases, by E. A. R. F. Baudet (pp. 383–473); Leukemia (pp. 474–483) and Tumors of Fowls (pp. 484–497), both by H. J. M. Hoogland; and Organic Diseases, also Vice, Castration, Narcosis, and Poisoning, by H. Veenendaal (pp. 498–582).

[Report of work on diseases and parasites of poultry], O. A. Barton (*North Dakota Sta. Bul. 233* (*1930*), *pp. 106–108, 110, figs. 3*).—Brief reference is made to tuberculosis eradication work in the college flock, the introduction of pullorum disease and coccidiosis into the flock and control work therewith, the control of lice and mites by the use of sodium fluoride, and the successful use of 1 and 2 per cent of cod-liver oil in preventing leg weakness in young chicks and poults.

In work with blackhead 33 poults were raised on rotated clean alfalfa range not previously used for other poultry without loss. The same year all but 4 of 45 poults placed on a range formerly used for chicken ranges and separated from the other lot only by a 20-ft. farm driveway died during the summer. An infestation of tapeworm is said to have been checked by the use of kamala.

The blood of fowls bit by Argas is virulent in the absence of detectable spirochetes [trans. title], E. Marchoux and V. Chorine (*Compt. Rend. Soc. Biol.* [*Paris*], *104* (*1930*), *No. 17, pp. 259, 260*).—It has been determined by the authors that the rise in temperature that occurs in the fowl 12 hours after being bit by an infected fowl tick is due to an invisible form of spirochete and not to an intoxication.

Pullorum disease (bacillary white diarrhea), C. E. Sawyer and C. M. Hamilton (*Western Washington Sta. Bul. 17–W* (*1930*), *pp. 19, figs. 7*).—This bulletin, presenting information intended for use by the breeder, hatcheryman, commercial poultryman, and others, on pullorum disease—its nature, diagnosis, and control measures—includes the results of some investigational work upon its diagnosis conducted by the station. The results of agglutination tests made in 1927 and 1928 of reacting birds purchased from several different poultrymen with a view to checking the accuracy of the test are noted. The majority were bled and tested at intervals about one month apart before being destroyed and autopsied. Only 4 of 67 hens tested in 1927 failed to give positive reactions on the eight periodic tests, and none of the 4 failed to react in more than two tests. Eighty-four per cent of these hens were found to harbor yolks which were typical of pullorum infection, and the organism was recovered in 81 per cent of the hens. Of the 74 hens and 5 cockerels similarly tested in the fall of 1928 none failed to give a positive reaction to the agglutination test at any time, and the organism was recovered in 89 per cent, in all of which gross lesions of the disease were demonstrated. All cockerels were destroyed and autopsied after the final test, and the pullorum organism was isolated from 60 per cent and gross lesions were found in 80 per cent.

Two laboratories cooperated with the station in conducting an agglutination test at 4-week intervals on blood samples from 30 hens, being repeated four times. The results of the tests, conducted by both the tube and blood methods, were in perfect agreement in every instance. The pullorum organism was recovered from all 15 positive reactors and from none of the 15 negative reactors, showing an efficiency of 100 per cent in detecting infected fowls.

In a whole blood agglutination test, made by a poultryman brought to the station for the purpose, with the test fluid sold by a poultry remedy company 7 of the 13 infected birds in a flock of 26 hens tested were missed, although the entire 13 birds consistently reacted to the agglutination test.

Bacillary white diarrhoea, G. Mayall (*Vet. Jour., 86 (1930), No. 5, p. 185*).—During the course of post-mortem examinations made in the spring of 1930, at which time pullorum disease was prevalent among chicks in England, a mortality rate of 95 per cent being common, nodules were found in all but 1 of 36 cases. In 2 cases there were nodules on the lungs, heart, and gizzard, in 16 cases on the lungs and heart, in 1 case on the gizzard only, in 2 cases on the heart only, and in 14 cases in the lungs only. The chicks came from 28 counties in England.

The occurrence of B. pullorum in hatching eggs, H. Altemeier (*Das Vorkommen von B. pullorum in Bruteiern. Inaug. Diss., Hyg. Inst., Tierärztl. Hochsch., Hanover, 1928, pp. 44*).—The first part of this account consists of a review of the literature, presented in connection with a list of 60 references. This is followed by a discussion of work conducted by the author. It was found that 15.44 per cent of the incubator eggs from reactor hens were infected with *Bacterium pullorum*, while of nontested hens 1.51 per cent were infected. Of 44 strains of the organism isolated, 31 were anaerogenic and 13 aerogenic.

Effect of pullorum disease on distribution of first year egg production, V. S. Asmundson and J. Biely (*Sci. Agr., 10 (1930), No. 8, pp. 497–507, figs. 2*).—In this continuation of the authors' studies of the effect of pullorum disease on egg production (E. S. R., 60, p. 580) data are presented on the first year egg production of 689 hens of six breeds hatched in 1926 and 1927. On the basis of tests at the end of the laying year, 102 birds reacted negatively and 587 reacted positively to the agglutination test for pullorum disease. The average first year egg production of the reactors was 61.59±4.38 eggs lower than that of the nonreactors, or 160 eggs for the former as compared with an average of 221 eggs for the latter. There was also more variation in the first year egg production of the reactors than of the nonreactors as shown by the standard deviation and the coefficient of variation.

Only 6.3 per cent of the nonreactors laid less than 150 eggs, as compared with 35.3 per cent of the reactors. On the other hand, 55.2 per cent of the nonreactors laid 225 or more eggs, while 14.7 per cent of the reactors made such records. The differences noted in first year egg production of reactors and nonreactors were consistent for the six breeds, although the exact figures varied. The egg production of the reactors was significantly lower than that of the nonreactors in every one of the 12 months. The actual difference varied from 3 eggs in November to 8 eggs in September. The egg production of the reactors was more variable as measured by the standard deviation except in October, when variability was reduced by the low egg production of the comparatively few reactors that were still laying. The coefficient of correlation shows that the egg production of the reactors is relatively more variable in every month than that of the nonreactors.

The birds hatched in 1927 were tested three times, at the beginning, the middle, and the end of the first laying year. Twenty-six birds reacted to all three tests, while 282 never reacted. A comparison of the egg production of these two groups gives results similar to those obtained when the birds are classified on the basis of a single test at the end of the year. The possible significance of apparent differences is discussed.

Infectious myxomatosis of rabbits: Observations on the pathological changes induced by virus myxomatosum (Sanarelli), T. M. RIVERS (*Jour. Expt. Med., 51 (1930), No. 6, pp. 965–976, pls. 4, fig. 1*).—The virus of infectious myxomatosis of rabbits (Sanarelli) induces multiple lesions in the skins, lymph glands, tunica vaginalis, epididymis, testicle, spleen, and lungs. Growth and destruction of cells in the epidermis overlying the myxomatous masses leads to the formation of vesicles. Cytoplasmic inclusions are found in affected epidermal cells. Occasionally, similar inclusions are seen in other involved epithelial cells. The nature of the inclusions is an open question. In the myxomatous masses situated in the subcutaneous and other tissues, evidences of alteration and growth of certain cells are observed.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the North Dakota Station], R. C. MILLER (*North Dakota Sta. Bul. 233 (1930), pp. 61–65, figs. 2*).—Tests of grain drills and beet planters for planting corn showed that grain drills, both fluted and internal double feed type of force feeds, will plant a uniform quantity of corn per acre but that they do not space the kernels a uniform distance. The double run internal feed showed somewhat more accurate adjustment as to quantity per acre, but in uniformity of spacing of kernels the test results indicated no choice. All the drills tested showed a great variation in spacing of kernels. Beet drills tested with the smallest beet seed plate and the slowest speed planted thickly enough, 8.1 in. average, and had slightly more uniform spacing than the grain drills. The beet drill can plant as efficiently as a corn planter if special corn plates are used. Tests with a corn planter showed that it was more efficient in drilling corn, 90 per cent of the kernels being spaced between 7 and 8 in. apart. The only cracking of kernels that was noticeable in all tests conducted was when the small side of double run internal feed grain drill was used.

Tests of the power requirements of various types of farm machines showed that the 4-bottom plow required relatively more power than the 3-bottom plow. This was due in part to the subsurface packer pulled in tandem, which required approximately 300 lbs. draft. From all draft tests it is evident that at quite uniform depths in the same field there will be a draft variation due to soil varieties and characteristics. Moist, firm sandy loam in low ground will naturally require more draft than a drier, loose sandy loam on high ground. Draft increases directly as the depth is increased. Tabular data on power requirements for plowing are included.

Data also are reported on grain drying (E. S. R., 63, p. 583) and on tests of the pulverator.

Surface water supply of the United States, 1926, III, VIII, X (*U. S. Geol. Survey, Water-Supply Papers 623 (1930), pp. VII+333, fig. 1; 628, pp. V+207, fig. 1; 630, pp. V+145, fig. 1*).—Of the papers which here present the result of measurements of flow made on streams during the year ended September 30, 1926, No. 623, prepared in cooperation with the States of New York, West Virginia, Ohio, Virginia, Illinois, Tennessee, North Carolina, and Alabama, covers the Ohio River Basin; No. 628, prepared in cooperation with the States of Texas and Colorado, the western Gulf of Mexico basins; and No. 630, prepared in cooperation with the States of Utah, Nevada, California, Oregon, Idaho, and Wyoming, the Great Basin.

Water supply and sewage disposal systems for farm homes, I. D. Wood and E. B. Lewis (*Nebraska Sta. Bul. 245 (1930), pp. 44, figs. 23*).—Practical information is given on the subject.

[Tile drainage investigations on the Trumbull County Experiment Farm] (*Ohio Sta., Co. Expt. Farms Rpts. 1929, Trumbull Co. Farm, pp. 1-3*).—The results of 11 years' drainage work on the farm are briefly summarized, indicating that on the heavy soils of Trumbull County there has been no gain in laying the tile much deeper than 18 in. In fact, putting them deeper has resulted in slightly lower yields.

Wheat showed the greatest increase in yield as the result of tile. As regards silage corn, oats, and mixed hay, the results apparently must be interpreted as quite favorable to the possibilities of growing fair yields without tile. The oat crop has consistently shown an increase from tile, but the money value of such increase with oats at 50 cts. a bushel is not large.

Influence of head on the movement of water in Gila clay and Gila clay loam, C. W. Botkin (*Agr. Engin., 11 (1930), No. 6, pp. 209-212, figs. 11*).—Studies conducted at the New Mexico Experiment Station are reported.

The results show that the head of water does not greatly influence the rate of water movement in Gila clay and Gila clay loam, and is of little consequence compared with the effect of compacting or of flocculation. This influence, however, is measurable. Higher heads cause small increases in both penetration and percolation in the flocculated soils. In the deflocculated soils the higher heads, for a time, cause small decreases in the rate of water movement. No marked change occurs in the rate of water movement when the dry soil becomes completely wetted. These phenomena appear to result from the swelling of the soil colloids, which is greater for the deflocculated soils and more effective in retarding water movement when the soils are more compact. A large increase in the head of irrigation water does not appear to give any practical assistance in the removal of alkali from heavy compact soils, and may hinder the process slightly if the heavy soils are very loose.

The moisture-saving efficiency of level terraces under semi-arid conditions, H. H. Finnell (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 522-529*).—The results of investigations conducted at the Oklahoma Panhandle Experiment Station are reported. The use of terracing to utilize 2.33 in. of run-off water annually, which when held on terraces has a penetrating efficiency of 34.5 per cent, increased the annual supply of soil water from 3.58 to 4.38 in.

The maximum depth of water permissible on the terrace at one time, L, was used as a constant expressive of the climatic and soil water relations peculiar to a certain locality and soil type because it may be used for more than one purpose. If this depth of water is known within reasonable limits, it can be used as an index number to determine the advisability of terracing for moisture saving and the size of terraces to use, as well as the basis for calculating the proper distance between terraces on different slopes. A suggested method of estimating the value of L is as follows: $\frac{C\ D—A\ F\ P}{F_1 E}=L$, where C represents the water-holding capacity of the soil in inches of plant-available water per foot of soil; D, the rooting depth of the crop grown in feet; A, the average annual rainfall in inches; F, the penetrating efficiency of the annual rainfall as percentage entering the soil; P, the percentage of total rainfall coming outside the growing season; F_1, the penetrating efficiency of terrace-held water as percentage entering the soil; and E, the average number of excessive rains received annually. The limit of terrace width would be calculated as $\frac{L^2}{2\ S\ A_1}$, with S representing the percentage slope of the land or matured terrace and A_1 the maximum run-off expected at one time.

The results of physical tests of road-building rock, compiled by D. O Woolf (*U. S. Dept. Agr., Misc. Pub. 76 (1930), pp. 148*).—This bulletin supersedes Department Bulletins 370, 670, and 1132 (E. S. R., 48, p. 884). It gives the results of tests of all samples of ledge rock made by the Bureau of Public Roads to January 1, 1928, classified alphabetically according to location.

Public Roads [August–September, 1930], (*U. S. Dept. Agr., Public Roads, 11 (1930), Nos. 6, pp. 113–132+*[2], *figs. 26; 7, pp. 133–152, figs. 24*).—These numbers of this periodical contain the following articles:

No. 6.—Freezing and Thawing of Soils as Factors in the Destruction of Road Pavements, by S. Taber (pp. 113–132), together with the status of Federal-aid road construction as of July 31, 1930.

No. 7.—Motor Truck Impact as Affected by Rubber Tread Thickness of Tires (pp. 133–138, 152) and The Interrelated Effects of Load, Speed, Tires, and Road Roughness on Motor Truck Impact (pp. 139–152), both by J. A. Buchanan.

Strength tests of sewed and riveted leather splices, J. G. Dent (*Agr. Engin., 11 (1930), No. 6, pp. 217, 218, figs. 2*).—Tests conducted at the Minnesota Experiment Station are reported.

The results show that there is considerable of an advantage in the sewed splice over the riveted not only in strength and appearance but also in that the ends of the leather are securely held down, preventing their being caught by some obstruction. In the riveted splice the corners of the strap are apt to curl up even though the rivets are placed near the end. The failure of the threads in some of the machine-sewed splices is due to the threads from each side being looped together in the center, whereas in the hand-sewed splice the two threads extend entirely through the leather and are independent of each other. The hand-sewed splice is weaker than the unspliced leather only because of the holes made by the awl at the ends of the splice.

Because of the larger head and burr, copper rivets make a stronger splice than tubular. Although the tubular rivets cut a slightly larger hole through the leather than was required for the copper, the rivets pulled through in every instance while the leather failed in all tests where three copper rivets and burrs were used. The tubular rivet cuts the surface of the leather to some extent when clinching, probably causing some loss of strength. It seems to be the general opinion that split rivets are more suited for other uses than for leather splicing.

The strength of the leather did not vary according to the thickness. Some of the strongest specimens were the thinnest.

Composite and solid steels for farm tillage implements, R. H. McMillen and F. F. McIntosh (*Agr. Engin., 11 (1930), No. 6, pp. 205–208, figs. 11*).—This is a detailed description of the metallurgy and manufacture of soft center and solid steels for use in different tillage implements.

Dynamic properties of soil affecting implement design, M. L. Nichols (*Agr. Engin., 11 (1930), No. 6, pp. 201–204, figs. 14*).—In a contribution from the Alabama Experiment Station the objectives of soil dynamics studies are briefly outlined and the variables involved are classified.

The general value of the relationships of colloid content, particle size, and moisture content to resistance, compression, cohesion, adhesion, and coefficient of friction are shown by curves. Soil structure is discussed, and the hypothesis is advanced that each soil has a normal structure which would afford a basis for quantitative studies of force reaction. The dynamic properties of plastic soils are shown to be indicated by the Atterberg plasticity constants with a sufficient degree of accuracy for safely predicting the soil's reaction to tillage forces from these constants.

The hill planting of cotton and checker cultivation with large tillage implements, J. O. Ware (*Agr. Engin., 11 (1930), No. 5, pp. 177, 178, figs. 2*).—The results of field experiments at the Arkansas Experiment Station are reported.

These showed that on bottom land or on other lands of a high degree of fertility cotton seems to produce as well when the plants are grouped in hills arranged for cross cultivation as when the plants are distributed in rows. Thickness of planting in hills appears to accomplish the same result in stimulating earliness as has been shown for close spacing in the drill. No exact number of plants to the hills seems necessary, and the number can range from 2 to 6 plants per hill, or around 10,000 to 25,000 an acre. However, since the production was lowered less with 15 plants to the hill than with 1 plant to the hill, the stand maintained should be nearer the upper limits of the range of highest yields rather than toward the lower side of this range.

Hill planting, cross harrowing, and checkered tillage practically eliminates the hoe as a weapon for killing grass and weeds, and renders hand thinning unnecessary except in an occasional hill where the plants are too numerous. The system of hill planting lends itself to easier adaptation of implements with larger tillage capacity, and a larger cultivated area per farmer will necessitate the utilization of more power units per man.

A 2- or 4-row hill dropping planter should be used, depending on whether a 2- or 4-row cultivator is to be employed. If motorized cultivation is to be practiced the 4-row machine is likely to be more economical. A cross-harrowing just previous to the sprouting of the cottonseed and a second cross-harrowing at another angle immediately after the plantlets have straightened up from germination should prevent any noxious plants from developing in the hills among the cotton plants. As a further precaution against the occurrence of foul plants, an early cultivation with a double-gang, spring-tooth cultivator is essential. The inside tooth of each gang should have a twist, so as to scoot fine dirt underneath the fender blades, thereby burying any tiny weed and grass seedlings that may be appearing around the young stalks. Rather large implements can be used to keep weeds and grass under control and to finish the seasonal cultivation.

Cleaning sugar beets in the field and mechanical loading [trans. title], R. BERNSTEIN (*Technik Landw., 11 (1930), No. 6, pp. 151–154, figs. 9*).—Experiments on the field cleaning and mechanical loading of sugar beets are reported. The results indicate that on heavy moist soil the cleaning of the beets can best be combined with the loading, and point to the practicability of a portable loader and cleaner which can be attached to the wagon.

The mechanical corn picker in Ohio, J. H. SITTERLEY (*Ohio Sta. Bimo. Bul. 146 (1930), pp. 168, 169*).—The results of a survey of the use of the mechanical corn picker by 65 Ohio farmers during 1929 are briefly presented, indicating that harvesting costs can be reduced by its use, although among other objections it is wasteful of corn and fodder and can not be used in wet weather.

Electric hay hoists, E. W. PILGRIM (*Agr. Engin., 11 (1930), No. 6, p. 212, fig. 1*).—Data are presented briefly for use in the design of electric hay hoists. It is pointed out that there is a wide range of hoisting speeds, and a hoisting speed of 75 ft. per minute is recommended, which would give a travel speed of 150 ft. per minute.

Taking into consideration the friction of the ropes through the pulleys, hoist friction, and belt slippage, a fair value to assume for over-all efficiency will be 65 per cent. To hoist 500 lbs. at 75 ft. per minute, with a hoist efficiency of 65 per cent will require 1.75 h. p. A 1,000-lb. load will require 3.5 h. p. A 3-h. p. motor is about the right size for hay hoists under ordinary conditions.

The rope speed for returning the fork should be the same as the travel speed. Hoists now on the market have a return speed of 2 to 3 times the travel speed, but this is too high and often gives trouble with tangled ropes. The car also strikes the stops with too great an impact.

The design and performance of small hammer-type feed mills, F. W. DUFFEE (*Agr. Engin., 11 (1930), No. 5, pp. 171–176, figs. 11*).—Studies conducted at the Wisconsin Experiment Station are reported. They dealt primarily with small mills for electric operation. No general conclusions are drawn.

The farm shop, L. J. SMITH and H. L. GARVER (*Washington Col. Sta. Pop. Bul. 147 (1930), pp. 24, figs. 8*).—This popular report is a contribution from the station and the Washington Committee on the Relation of Electricity to Agriculture. It gives practical information on the organization and management of the farm shop using electricity as a source of energy.

Wind stresses in buildings, R. FLEMING (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. XI+193, figs. 65*).—This book is a summary of the author's investigations on wind stresses over a period of 17 years. It contains chapters on an introduction to a study of the wind, classification of the winds, hurricanes and tornadoes, wind pressure and wind velocity, wind stresses in steel-mill buildings, wind stresses in many-storied buildings, the design of details for wind bracing in tall buildings, the Lincoln Building, and earthquakes and earthquake resistance.

Farm building plans, J. C. WOOLEY (*Missouri Agr. Col. Ext. Circ. 247 (1930), pp. 27, figs. 35*).—Plans for the construction of several different types of farm structures are presented.

The cost of farm buildings, D. G. CARTER (*Agr. Engin., 11 (1930), No. 5, pp. 190, 191, figs. 4*).—In a contribution from the Arkansas Experiment Station data on the cost of several different types of farm buildings are presented.

The data from 25 structures indicate that the cost per cubic foot decreases as the volume of the structure increases. Added height has a much smaller effect on the total cost than either width or length. Bid prices remain fairly constant under uniform factors of material, labor, and transportation regardless of locality. It is impossible to estimate accurately for a special location. Typical larger farm structures, such as barns, machinery buildings, and grain storages of normal sizes and capacities, cost approximately 6 cts. per cubic foot. Because of lesser volume and lack of equipment, the machinery, products, and grain storages cost less in every case than the barns on a square-foot basis. The addition of the tile walls and steel equipment, while adding to the cost to some extent, does not represent a very large proportion of the total.

Building plans for the dairy farm, J. B. Kelley (*Ky. Agr. Col. Ext. Circ. 128, rev. (1930), pp. 82, figs. 59*).—This revision (E. S. R., 48, p. 386) presents additional working drawings and practical information on dairy-barn construction.

A temperature study of dairy barn floors, R. Bainer (*Agr. Engin., 11 (1930), No. 5, pp. 187–190, figs. 9*).—Studies conducted at the Kansas Engineering Experiment Station are reported.

The results show that whether or not dairy barn stalls should be surfaced with a material having low heat-conducting characteristics depends upon the winter temperature of the region in which the barn is located. For Kansas conditions a floor constructed entirely of concrete would probably be more practical, since the temperatures in the State are hardly ever below zero. In States where low winter temperatures of long duration are encountered, stall materials of low heat conductivity might be used, thus providing a much warmer floor.

The cost of cork brick and wood blocks is approximately 50 cts. per square foot. Material for covering cow-stall floors will cost approximately $5 per cow. If this cost is distributed over the usual term of service, the yearly cost per cow is very small. For general farm use it is unnecessary and inadvisable to cover the entire barn floor with wood blocks or cork brick. Instead the standing platform should be of this material, and the remainder of the floor, the gutters, alleys, and mangers may well be of concrete. By using wood blocks or cork brick in the stall only, the cost of their installation will be only a fraction of that for the entire floor.

Although a floor constructed of wood plank is much warmer than a concrete floor, it is insanitary, is relatively short lived, and when worn offers a possibility of injury to stock from splinters. Its unfavorable features outweigh its favorable ones, so this material should be considered as unsuited to the purpose. The life of a floor made of creosoted pine block is about twice that of one made of cork brick; however, a wet cork-brick floor is not as slippery as one made of pine block.

Tests of a commercial sweet potato storage house, M. A. R. Kelley (*Agr. Engin., 11 (1930), No. 5, pp. 181–184, figs. 3*).—Studies conducted by the U. S. D. A. Bureau of Public Roads in two experimental storages are reported.

The results indicate that unform temperatures, with reasonable control of humidity, can be maintained in sweetpotato storage houses, provided the operator appreciates the requirements of good storage and will devote the time essential to proper observation of air conditions and adjustment of the heating and ventilating systems.

The moisture loss from sweetpotatoes cured on a commercial scale at a temperature between 80 and 85° F. is less than from those cured at a lower temperature.

The new laying house at the station's poultry plant, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 146 (1930), pp. 135–144, figs. 7*).—A description is given of the new laying house recently added to the station poultry plant.

Report of conference on spontaneous heating and ignition of agricultural and industrial products, 1929 (*U. S. Dept. Agr., Bur. Chem. and Soils,* *1930, pp. 111+127, fig. 1)*.—The proceedings of this conference, which was called by the National Fire Protection Association in cooperation with the U. S. Departments of Agriculture and Commerce, are presented.

Among others the following special topics are discussed: Spontaneous heating and ignition as a problem of agriculture, spontaneous heating and ignition as a problem of commerce, the interest of business in the prevention of losses due to spontaneous ignition, the storage of farm products, feed and cereal storage, spontaneous ignition of hemp and other combustible fibers, sugar storage, and fire fighting.

RURAL ECONOMICS AND SOCIOLOGY

Proceedings [of the First] International Conference of Agricultural Economists, 1929 (*[Ithaca, N. Y.: C. E. Ladd, Cornell Univ., 1930], pp. [362], figs. 7*).—Included are the following papers and discussions thereon presented at the First International Conference of Agricultural Economists, held at Dartington Hall, Totnes, Devon, England, August 26 to September 6, 1929; Land Tenure in England, by C. S. Orwin; Land Tenure in Ireland, by D. A. E. Harkness; The Problems of Land Tenure in the Highlands of Scotland, by J. P. Maxton; Some Methods Used in Agricultural Economics Research, by G. F. Warren; Review of Cost Accounting Methods in England, by A. Bridges; Farm Management Research in Minnesota, by G. A. Pond; Cost Accounting Results in Yorkshire, by V. Liversage; Farm Accounting in Illinois, by H. C. M. Case; Farm Management Research in Saskatchewan, by W. Allen; Farm Management Research in the Province of Ontario, by J. Coke; Changes in the Size of Agricultural Holdings in England and Wales during the Last 100 Years, by E. Thomas; The Economic Situation in European Agriculture, by R. R. Enfield; The Occupational Distribution of Wealth, by H. C. Taylor; Relation of the Tariff to Farm Relief in the United States, by H. A. Wallace; The Trends of Agricultural Production and of Population, with Special Reference to the United States, by O. E. Baker; The Empire Marketing Board, Its Constitution and Functions, by G. M. Dykes; Agricultural Education and Research in Britain, by T. Middleton; Sugar Production in the British Colonies, by C. Y. Shephard; Cooperative Marketing of Agricultural Produce and Buying of Farm Supplies in Finland, by K. T. Jutila; Agricultural Cooperation in Norway, by P. Borgedal; Cooperative Marketing in Denmark, by O. H. Larsen; The Agricultural Situation in Germany, by H. Zerner; The History of the Political and Economic Clash between Agriculture and Industry during the Past Hundred Years, by J. Orr; Research in Milk Marketing in England as Illustrated by a Survey in Derbyshire, by F. J. Prewett; Methods and Results of Research in Marketing Dairy Products in the United States, by L. Spencer; and Some Methods and Results of Research in the Marketing of Fruits and Vegetables in the United States, by M. P. Rasmussen.

A list of persons attending the conference, committee reports, the discussions in the conference on the validity of conclusions drawn from farm management records for a single year and on enterprise accounts and financial accounts as a basis for advice to farmers, and the discussion of a paper by A. W. Ashby on Population Problems are also included.

This report is in mimeographed form.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 146 (1930), pp. 170–173*).—Investigations not previously noted are reported on as follows:

Income and expenses of the Ohio agricultural industry in 1929, V. R. Wertz (pp. 170, 171).—A table is given showing by years 1924–1929 the estimated gross and net incomes and cash expenses of the Ohio agricultural industry, and those for 1929 are compared with 1928 and the average for the period 1924–1928. The net cash income in 1929 was 7 per cent higher than that in 1928 but 19.5 per cent less than the average for the period 1924–1928.

Index numbers of production, prices, and income, J. I. Falconer (p. 173).—The table previously noted (E. S. R., 63, p. 681) is brought down through June, 1930.

[Investigations in farm management and rural organizations at the North Dakota Station, 1927–1929] (*Noth Dakota Sta. Bul. 233 (1930), pp. 77, 78, 87–92, figs. 5*).—A brief analysis of the tenant problem of the State showed that 39 per cent of the rented land is rented by landowners, and that there was a steady decrease in the number of full owners and a steady increase in the number of tenants from 1910 to 1925. The number of part owners decreased from 1910 to 1920, but increased slightly from 1920 to 1925. Land values reached the peak in 1920, about 42 per cent above the pre-war level, but have again decreased to about the pre-war level and seem to have become stabilized.

Some preliminary results are included of a study made by E. A. Willson in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of 98 farmers' and rural community clubs and of 20 communities to detrmine the factors entering into the success or failure of rural social organizations.

Ranch organization and management in western North Dakota, M. B. Johnson (*North Dakota Sta. Bul. 237 (1930), pp. 78, pl. 1, figs. 14*).—This bulletin presents the results of the study of detailed records of 15 North Dakota ranches for the years 1926–1928 and the analysis of other information relating to cattle ranching in the State. The records were collected as part of the cooperative detailed study of ranches of the northern Great Plains region made by the Bureaus of Animal Industry and Agricultural Economics, U. S. D. A., and the State experiment stations of Montana, Wyoming, North Dakota, and South Dakota.

Tables with discussions are included showing for 1927 the amount and type of land operated, cattle inventories, births, sales, and losses, investment by items, crops produced, and ranch income and expenses on a representative ranch in a section of North Dakota having 30 per cent nontillable grazing land, and on one in a section having 95 per cent of such land. Suggested adjustments are made for each ranch and estimates as to the returns, expenses, etc., of the adjusted ranches.

The principles of ranch organization and management, range cattle management, marketing of cattle, cash crop and feed production, the land situation, and climatic conditions in western North Dakota are discussed.

Types of farming in Nebraska, H. Hedges and F. F. Elliott (*Nebraska Sta. Bul. 244 (1930), pp. 76, figs. 35*).—The development of Nebraska farming and the factors affecting it, the geographical location of different crop and livestock enterprises, and the nine types of farming areas of the State are discussed and explained. The method of determining typical farming systems, the ways such systems may be used, and the use of results in determining long-time systems of farming in interpreting agricultural outlook data, and in other lines of research work are also discussed.

A study of farm ownership in five typical farming towns in Pangasinan, D. R. Cabrera (*Philippine Agr., 19 (1930), No. 3, pp. 179–191*).—This study is based upon data obtained from 389 farmers with farms ranging from 1 to 100 hectares in area. The acquisition of the farms involved 742 separate transactions during the period 1870–1928. Inheritance represented 45.1 per cent of the transactions, gifts 1.2, marriage 13.5, and purchase 40.1 per cent. Of those acquiring their land in whole or in part by purchase, 94.5 per cent earned the purchase money by farming alone. Of the 389 farmers, 71.7 per cent derived their entire income from farming, 56 per cent reported a surplus over expenditures, 89.7 per cent had no farming experience prior to acquiring land other than that with their fathers, 1.6 per cent had been farm laborers for an average of 7.3 years, 3.3 per cent had been tenants for an average of 12.5 years, and 3.6 per cent had been in other occupations for an average of almost 8 years. The average age at which farms were acquired increased from 20.3 years for the decade 1870–1879 to 24 years for the period 1920–1928.

The land and the peasant in Rumania: The war and agrarian reform (1917–21), D. MITRANY (*London: Humphrey Milford, Oxford Univ. Press; New Haven: Yale Univ. Press, 1930, pp. XXXIV+627, pl. 1, figs. 8*).—This is one of the series of publications of the Carnegie Endowment for International Peace dealing with the Economic and Social History of the World War. Part 1 deals with the agrarian problem in Rumanian history. Part 2 discusses the political history, nature, and general legislative provisions of the new land reform, beginning with the decree laws of 1918 and 1919. Part 3 includes chapters on the effects of the reform on the distribution of land property, the organization of farming, production, and rural economy; on the effects of the States' economic and financial policy upon the working of the reform; and on the social and political effects of the reform. An introductory chapter is included on the effect of the World War upon the agrarian structure of Europe.

Agricultural Russia on the eve of the revolution, G. PAVLOVSKY (*London: George Routledge & Sons, 1930, pp. X+340, figs. 3*).—This is a thesis approved for the degree of doctor of philosophy in the University of London. The several chapters deal with natural conditions; historical and economic influences; the agricultural regions of Russia; the Russian agrarian problem, its origin and development; the agrarian reforms—enclosures (1907–1916); internal colonization and emigration beyond the Urals; agricultural Russia on the eve of the Great War; characteristics of Russia as an agricultural country—the origin and disposal of the surplus; the evolution of arable farming on the eve of the war; and Russia's livestock and the evolution of stock farming.

North Carolina: Economic and social, S. H. HOBBS, JR. (*Chapel Hill: Univ. N. C. Press, 1930, pp. XVIII+403, figs. 35*).—This book outlines an economic and social interpretation of the State, and is intended as a source book for economics and social courses in the public education curriculum of the State and in the University of North Carolina on North Carolina. The several chapters deal with physical resources—land, soils, climate, and forests, water power and minerals, and resorts, fishing, and hunting; population composition and characteristics; physical and social-economic areas; North Carolina as an agricultural State; farm tenancy; industry in North Carolina; financial institutions; transportation and communication; wealth, debt, and taxation; ruralism and urbanization; State government; county government in North Carolina; public education; illiteracy and reading habits; public health and health work; and public welfare in North Carolina.

The seasonal distribution of farm labour requirements, W. H. KIRKPATRICK (*Cambridge Univ. Dept. Agr., Farm Econ. Branch Rpt. 14 (1930), pp. IV+44, figs. 16*).—This publication deals with the labor requirements (total and seasonal) of enterprises common to farming in the eastern counties of England. It is based on data obtained from the labor records (manual, horse, and tractor) for 1927 and 1928 of 12 fully costed farms in 6 counties.

The Agricultural Credits Act, 1928, L. LE M. MINTY (*Econ. Jour., 40 (1930), No. 158, pp. 249–258*).—A brief description is given of the provisions of the English act of 1928.

Growth of wheat consumption in tropical countries, M. K. Bennett (*Wheat Studies, Food Research Inst. [Stanford Univ.], 6 (1930), No. 7, pp. [1]+341–350, figs. 7*).—Tables and charts are presented showing, by years 1909–1928, the index numbers of population and of wheat consumption in Brazil, tropical Central and South America (excluding Brazil), the West Indies, tropical Africa, tropical Asia, and Oceania. Countries producing wheat in the several areas are excluded. The annual average total consumption increased from 46,943,000 bu. in the period 1909–1913 to 65,578,000 bu. in the period 1923–1927, and the per capita consumption from 11.24 to 12.67 lbs. of flour.

Operating costs of retail grain stores in New Hampshire, E. H. Rinear (*New Hampshire Sta. Bul. 251 (1930), pp. 32, fig. 1*).—A state-wide survey was made and reports were obtained from 197 stores in 1926. Detailed accounts of the business transacted during 1928 at 41 stores were also obtained.

The State survey showed that 15 per cent of the feed and grain was sold at the car door, 62 per cent at the store, and 23 per cent delivered to customers. Analysis of the 1928 records showed the average gross margin and net profits to be 11.22 and 0.46 per cent, respectively, of sales. Fixed costs constituted 24.63 per cent of total costs, labor costs 51.7 per cent, delivery costs 8.63 per cent, and other costs 15.04 per cent. The average investment turnover in relation to sales was 4.04 times and the average inventory turnover 10.2 times. An increase of 1.5 times in the number of investment turnovers was found to decrease fixed costs per dollar of sales 2 cts. An increase of 3 times in the number of inventory turnovers decreased total costs 1.7 cts. per dollar of sales. The average number of employees per store was 3.7 persons, and the sales per hour of occupied time ranged from $8.06 to $20.04, averaging $10.52. The average turnover of accounts receivable was 38 days. While prices on the Boston wholesale market changed 40 times on a weekly basis during the year, the stores shifted prices only 14.5 times. The lag in store prices averaged 2.6 weeks on upward changes and 4.8 weeks on downward changes.

Washington apple prices and costs of shipping point marketing services, C. C. Hampson and E. F. Dummeier (*Washington Col. Sta. Bul. 242 (1930), pp. 111, figs. 4*).—This study of prices and handling costs of apples covers the seasons 1922–1927 and is based chiefly on data obtained from the records of marketing organizations of the State. Data on shipments of apples were obtained from the Bureau of Agricultural Economics, U. S. D. A., and the traffic associations of the two main districts. Tables are included and discussed showing the shipments, by districts; the shipments and prices, by varieties and grades of fruit; and the average costs in each district for each of the several years of central packing, warehousing, grower-paid shipping-point storage, and selling.

From 1921–1924 to 1925–1928 shipments increased 19.8 per cent in the Yakima district, 15.5 per cent in the Wenatchee-Okanogan district, and 0.5 per cent in the Walla Walla district, and decreased 44.5 per cent in the Spokane district and 15.8 per cent in the White Salmon district. Of the total shipments in the Wenatchee-Okanogan and Yakima districts, 40.9 per cent were Winesaps, 17.7 Jonathans, 13.7 Delicious, and 10.4 per cent Rome Beauty. Forty and six-tenths per cent of the shipments in the sample taken (approximately 40 per cent of the total shipments) were Extra Fancy, 36.2 per cent Fancy, 19.6 per cent C grade, and 1.4 per cent Combination Extra Fancy and Fancy. Winesap shipments averaged 47.2 per cent and Delicious shipments 48.8 per cent Extra Fancy.

For the period studied central packing costs averaged 41.6 cts. per box, there being about 10 per cent increase during the last two years. Warehousing averaged 7.5 cts. per box, and the trend was slightly upward. Grower-paid shipping-point storage averaged 5.3 cts. per box, having increased from 4.5 cts. in

1922 to 6.5 cts. in 1927. Selling charges averaged 10.8 cts. per box, having increased 5.7 per cent during the period. The average net price for packed fruit delivered to the warehouse was $1.219 per box, the averages for the different grades ranging from 76.8 cts. for fourth grade to $1.48, $1.453, and $1.136 for Extra Fancy, Combination Extra Fancy and Fancy, and Fancy, respectively. The average price realized by growers for loose fruit delivered to the packing house was 80.3 cts. per box, ranging from 46 cts. in 1923 to $1.26 in 1924.

Report of the royal commission investigating the fruit industry (and interrelated conditions) of the districts territorially known as the Okanagan, Kootenay, and Kettle River of the Province of British Columbia, Part I, W. S. EVANS (*Victoria: Prov. Govt., 1930, pp. 23*).—Included are the findings and recommendations of the commissioner regarding the value and adaptability of lands, irrigation systems and their charges, and water supply.

Report on the marketing of cattle and beef in England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 20 (1929), pp. 171, pls. 29, figs. 3*).—This report is in part complementary to that previously noted (E. S. R., 55, p. 186). The supplies (home and imported), production, prices, assembling and grading, transportation, and marketing and processing of cattle; the wholesale and retail trade in meat; the grading and marking of beef; and the disposal of by-products, offals, and condemned carcasses are discused. Observations and conclusions as to, and suggestions for, the improvement of the beef industry are also included, together with appendixes giving the cattle classes and grades and beef grades in the United States.

Market organization, R. S. VAILE and P. L. SLAGSVOLD (*New York: Ronald Press Co., 1930, pp. XVIII+498, figs. 31*).—This text was prepared for use in a 12-week term of the introductory economics course in the University of Minnesota. The subject is dealt with in chapters as follows: Economic organization, marketing in the business organization, marketing functions, some concepts of markets and trade, classification of commodities, central market structure, market structure for consumer goods, market demand, demand manipulation, market price, price policies, market risk, market research, commodity exchanges, transportation and marketing, metropolitan areas and centers, international marketing, costs of marketing, concentration in marketing, agricultural distributive cooperation, consumer cooperation, trade associations, standardization and simplification, the relation of government to marketing, and final criticism.

Cooperative marketing and purchasing, 1920–1930, R. H. ELSWORTH (*U. S. Dept. Agr. Circ. 121 (1930), pp. 56, figs. 16*).—Data are presented "based on a count of the active farmers' business associations in 1930, with estimates as to the membership in 1928 for each of the States in the various commodity groups and estimates on the same basis for the business transactions for the 1927–28 marketing season."

Tables are included showing the number of farmers' business associations by kinds and States, 1930; number of associations and estimated membership and business, 1927–28, for the leading States and commodity groups; and the number, estimated membership, and estimated amount of business, 1927–28, by States, of marketing and purchasing associations handling cotton and cotton products, dairy products, forage, fruits and vegetables, grain, livestock, and nuts. Other tables show data as to the business done in previous years by the more important associations handling different products.

The circular brings up to date the more important part of Technical Bulletin 40, previously noted (E. S. R., 58, p. 787).

The cooperative movement: A selected bibliography (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 31 (1930), No. 3, pp. 230–249*).—Publications since March, 1925, in the United States and foreign countries on cooperation for different purposes, including agricultural cooperation, are classified by country and type of cooperation.

Agricultural co-operation in England (*London: George Routledge & Sons, 1930, pp. VIII+272, pl. 1*).—The history of cooperation in England is traced, and the structure of cooperative societies and the present status of such organizations for supplying requirements, for marketing milk and dairy produce, livestock and meat, wool, eggs, hops, and fruits and vegetables, and for insurance and other services are described. Cooperative organization among holders under the Small Holdings and Allotment Acts is briefly discussed. A detailed survey by counties (pp. 28–165) is included of the existing cooperative organizations.

This book was prepared by The Horace Plunkett Foundation.

Handbook of foreign tariffs and import regulations on agricultural products.—III, Canned foods in the Western Hemisphere, R. P. Wakefield and R. S. Hollingshead (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 97 (1930), pp. XIII+379*).—This is the third of the series previously noted (E. S. R., 63, p. 284). Information is given as to the imports of canned foods, duties, taxes, marking, documentation, sanitary requirements, and laws affecting canned foods in the countries of the Western Hemisphere.

Status of the income tax as a source of State school revenue, F. H. Swift (*Amer. School Bd. Jour., 81 (1930), No. 4, pp. 60, 61, 125*).—The use of receipts from income taxes for school purposes in the 14 States having income tax laws is briefly discussed.

The relations of economic, social, and educational advancement of farmers to their membership in organizations, L. D. Howell (*Oklahoma Sta. Bul. 185 (1929), pp. 54, fig. 1*).—This study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., is based upon data obtained by interviews during December, 1925, and the first half of 1926 with members and nonmembers of the Oklahoma Cotton Growers' Association in 8 counties in the cotton belt of Oklahoma. The material is discussed under the headings of the relations of membership in the association, of church membership, and of educational advancement of operators to economic progress, membership in other organizations, educational advancement (of children in case of educational advancement of operators), and standard of living, and of the relation of economic advancement to membership in organizations.

For members both of the association and of churches, the average age was higher, a larger percentage were farm owners, moves from farm to farm less frequent, the average amount of capital operated and the average total and annual accumulation of net wealth less inheritance were greater, a larger percentage were members of other organizations, and the standard of living as indicated by expenditures, equipment, comforts, and conveniences was higher than for nonmembers. The educational advancement of operators, their wives, and children was higher for members than for nonmembers of the association, but little or no difference was found between members and nonmembers of churches. With the increase in educational advancement of farmers the average age decreased, and the percentage of owners, years between moves, amount of capital operated, and the total and annual accumulation of net wealth less inheritance increased. High positive relationships were found between educational advancement of operators and the educational advancement of their children and the standard of living. The stability of farmers and the percentages who were owners and members of the association, churches, lodges, etc., increased with the increase in the rate of accumulation of net wealth less inheritance.

Rural standards of living: A selected bibliography, compiled by L. O. BERCAW (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 32 (1930), pp. II+124*).—This is a selected bibliography of books, pamphlets, and periodical articles issued in the United States since 1920. A few foreign and urban references and a few publications issued prior to 1920 are also included.

Rural community life, L. O. LANTIS (*New York: Amer. Book Co., 1930, pp. VIII+375, figs. 100*).—"It is the aim of this book to discuss social conditions in rural communities and to offer suggestions for improving the standard of living of rural citizens, (1) by explaining the nature of various social problems that exist in the average rural community, (2) by outlining how surveys may be made to obtain adequate information pertaining to the problems, (3) by suggesting ways and means of solving the problems successfully, and (4) by providing project material in the nature of local community problems in order that students may receive specific training for citizenship in their respective communities."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Fundamentals of farming and farm life, E. J. KYLE and A. C. ELLIS (*New York: Charles Scribner's Sons, 1930, [rev. ed.], pp. XXX+450, figs. 241*).—Extensive revision has been made of the text previously noted (E. S. R., 48, p. 497) to include new knowledge and practices.

Supervised practice in agriculture, including home projects, R. D. MALTBY (*Fed. Bd. Vocat. Ed. Bul. 112, rev. ed. (1930), pp. VII+53*).—This is a revision of the bulletin previously noted (E. S. R., 55, p. 888).

Crop production and management, J. F. COX (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 2 ed., rev., pp. XII+469, pl. 1, figs. 188*).—This is a revision of the handbook previously noted (E. S. R., 52, p. 696).

Farm crops projects, W. L. BURLISON and A. W. NOLAN (*New York: Macmillan Co., 1930, pp. XXV+458, figs. 88*).—This is a farm-crops rule and study-guide book for use in vocational agriculture teaching.

Dairy cattle: Selection, feeding, and management, W. W. YAPP and W. B. NEVENS (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 2. ed., pp. XIX+390, pls. 2, figs. 120*).—This is a revised edition of a book previously noted (E. S. R., 55, p. 66).

Dairy enterprises, J. C. MCDOWELL and A. M. FIELD (*Philadelphia and London: J. B. Lippincott Co., 1930, pp. VII+471, pls. 4, figs. 223*).—This is a textbook prepared on the job-analysis plan. Each job outline includes a statement of conditions usually found, of aims, of problems for study and discussion, of local things to do, questions for debate, and a list of references.

Simple farm accounts, R. E. WILLARD (*Fargo, N. Dak.: Author, 1930, 4. ed., pp. 102*).—This is the fourth edition of the textbook previously noted (E. S. R., 53, p. 95).

Earning and spending the family income, M. R. FRIEND (*New York: D. Appleton & Co., 1930, pp. X+415, figs. 65*).—This is a textbook for use in high schools. Special attention is given to attitudes and understandings concerning earning and spending in the eight units dealing with home, the basic institution in our social organization; American standards of living; the financial organization of the household; consumption; the purchase of food; the purchase of clothing; the purchase of shelter; and expenditure for advancement.

Trends in extension work in home economics, C. W. WARBURTON (*U. S. Dept. Agr., Ext. Serv. Circ. 133 (1930), pp. 11*).—This mimeographed circular describes the trends in the personnel employed on Federal and State extension funds, the number and training of local leaders, formation of county programs of work, organization of such work, teaching methods, and lines of work undertaken in home economics extension work.

Agricultural evening schools, J. H. Pearson (*Fed. Bd. Vocat. Ed. Bul. 89, rev. (1930), pp. VII+13*).—This is a revision of the bulletin previously noted (E. S. R., 50, p. 495). Promotion of the work, securing an enrollment, content of the course, organization of schools, evening-class procedures, supervised practice, and the selecting and training of teachers are discussed.

State direction of rural school library service, E. A. Lathrop (*U. S. Dept. Int., Off. Ed. Bul. 6 (1930), pp. V+50, fig. 1*).—"This study shows for each of the 48 States the principal State agencies that are directing library service for rural schools, and describes the administrative machinery that these agencies have set up for the performance of their duties. It also discusses the chief rural school library activities of the agencies."

FOODS—HUMAN NUTRITION

Index to the literature of food investigation, compiled by A. E. Glennie (*[Gt. Brit.] Dept. Sci. and Indus. Research, Index Lit. Food Invest., 1 (1929), No. 2, pp. IV+154*).—This is the second list of annotated literature references in the series noted previously (E. S. R., 62, p. 287).

Bread: A collection of popular papers on wheat, flour, and bread, H. Snyder (*New York: Macmillan Co., 1930, pp. X+293, pls. 20*).—This collection of papers and essays on wheat, flour, and bread by H. Snyder also includes a preface by W. C. Edgar, a biographical sketch of Professor Snyder by A. L. Winton, an account of his work on soils and fertilizers by F. J. Alway, and a final compilation of his various publications from books, bulletins, and pamphlets to popular articles.

The rôle of molasses in cookie making, E. L. Stephens and A. M. Child (*Food Indus., 2 (1930), No. 5, pp. 203–206, fig. 1*).—In this study at the Minnesota Experiment Station the effect of various factors upon the quality of molasses cookies was determined with seven brands of molasses, including representative samples of high, medium, and low grades. A basic formula and a uniform method of combining ingredients were followed. In the first experiment the only variables were the molasses and sodium bicarbonate, in the second the time and temperature of baking, and in the third the time and temperature for allowing the dough to stand before baking.

High-grade molasses produced cookies superior in every respect except texture to those made with medium or low-grade molasses. The quantity of sodium bicarbonate as increased from 0 to 5 gm. for each 130 gm. of molasses affected color, flavor, aroma, and texture. The best results were obtained with 3 gm. of the sodium bicarbonate, this giving pH values in the cookies between 7.5 and 8.4. A high temperature, 475° F. (246° C.), for a short time (5 minutes) gave the best results. Allowing the dough to stand in the refrigerator at 40° F. for 24 hours improved the consistency, making it more easy to roll, cut, and transfer to the baking sheets,

Veal cookery, E. Latzke (*North Dakota Sta. Bul. 233 (1930), pp. 66, 67*).—Various methods which have been developed for the cookery of veal are summarized briefly. The thigh and loin are considered the most desirable cuts for roasting, particularly the thigh. In the method found most satisfactory, using a thermometer inserted in the roast, the roast is placed in the lower half of a double roaster and seared in an oven at 275° C. (527° F.) for 15 minutes and then covered and cooked at 125° C. (257° F.) until the internal temperature registers 71° C. (160° F.). This method requires a cooking time of about 20 minutes per pound and is said to produce "a roast uniformly cooked throughout, juicy, golden brown on the surface, with drippings brown enough for an attractive gravy."

Various ways of larding veal to overcome the dryness resulting in cooking on account of the high percentage of water and low percentage of fat have been tried. Of the various fats used as lardoons, salt pork is considered to give the best flavor with the veal. Larded veal chuck seared and roasted slowly in a cast aluminum drip-drop kettle over a surface burner is said to be very palatable and to require only about one-fifth as much gas for cooking as when the cooking is carried on in the oven. The time required is approximately 35 minutes per pound.

Directions are also given for stewing small cuts of veal. For this the cast aluminum drip-drop kettle is also considered desirable. The meat is cut in approximately 2 in. cubes and seared at a temperature of from 375 to 400° F. for 15 minutes, with the addition of small pieces of salt pork (5 per cent of the weight of the veal). Water to approximate 1 cup to 1 lb. of the meat is added to the seared product. The temperature is adjusted as quickly as possible to 90° C. (194° F.), and the cooking continued at this temperature for approximately 45 minutes after the internal meat temperature has reached 90° C.

Cooking and canning tests with vegetables and fruits, E. LATZKE (*North Dakota Sta. Bul. 233* (*1930*), *pp. 68, 69*).—In this progress report of cooperative projects between the home economics and horticultural departments, brief mention is made of jellying studies with crab apples and of studies on the cooking and canning qualities of a new variety of winter squash.

In making crab-apple jelly, the jellying point was found to take place at a temperature ranging from 101.5 to 103° C. (214.7 to 217.4° F.). The most desirable product from the standpoint of texture and flavor was obtained with the use of three-fourths measure of sugar to each measure of fruit.

In the squash studies, baking tests with individual 8- to 10-oz. pieces showed that slow cooking at low temperatures gave a more desirable product than more rapid cooking at higher temperatures. A temperature of 400° F. for 60 minutes or 350° for 80 minutes proved satisfactory.

Laws of science govern food preservation, F. W. FABIAN (*Michigan Sta. Quart. Bul., 13* (*1930*), *No. 1, pp. 17–19*).—This is a brief nontechnical discussion of the spoilage of food through the action of enzymes, molds, yeasts, and bacteria, and of the prevention of such spoilage through canning and preservation.

[**Symposium on quick freezing**] (*Food Indus., 2* (*1930*), *No. 4, pp. 146–179, figs. 32*).—Practically the entire issue of this journal is devoted to authoritative papers on this subject. The subjects and authors of some of the papers are as follows: Solving the Problems of Rapid Freezing, by H. F. Taylor (pp. 146–151); How Fillets Are Frozen by the Cooke Method, by L. V. Burton (pp. 152–154); Packaging Quick-Frozen Foods, by C. Birdseye (pp. 156–158); Freezing Fish by the Birdseye System, by E. S. Pattison (pp. 159–161); Freezing of Fruits and Vegetables Requires More Research, by H. C. Diehl (pp. 162–164); Why Quick-Freeze? by C. F. Kolbe (pp. 165–168); Reactions of Public to Frozen Foods Are Tested (p. 175); Canada Experiments with "Ice Fillets," by R. A. McKenzie and J. W. R. Harkness (pp. 176–178); and Ice Cream Improved by Quick-Freezing, by C. D. Dahle (pp. 178, 179).

The production by staphylococci of a substance causing food poisoning, E. O. JORDAN (*Jour. Amer. Med. Assoc., 94* (*1930*), *No. 21, pp. 1648–1650*).—The investigation of a recent outbreak of food infection in Chicago showed that a Christmas cake apparently responsible for the outbreak contained a yellow staphylococcus which produced a toxic substance in broth. An examination of other staphylococcus strains showed that various strains of unlike origin and different cultural characteristics are capable of generating in broth a substance which, on ingestion, produces gastrointestinal disturbances. The toxin is destroyed by boiling and is either destroyed or greatly weakened by being heated at from 60 to 65° C. for 30 minutes.

An outbreak of food poisoning proved to be due to a yellow hemolytic staphylococcus, G. M. Dack, W. E. Cary, O. Woolpert, and H. Wiggers (*Jour. Prev. Med., 4 (1930), No. 2, pp. 167–175*).—A more detailed report of the investigation of the outbreak noted above.

Biological values and the behavior of food and tissue proteins, K. Thomas (*Jour. Nutrition, 2 (1930), No. 4, pp. 419–435, fig. 1*).—This review consists chiefly of a discussion of methods employed in the determination of the biological values of proteins, with particular emphasis on the individual factors which influence the practical value of a protein and of the behavior of food and tissue proteins in metabolism. In the first discussion the author's method of nitrogen balance experiments is designated as the analytical method and the newer growth comparison method with small animals as the synthetic method. Advantages and disadvantages of both methods are discussed.

Further experiments on the influence of food upon longevity, H. C. Sherman and H. L. Campbell (*Jour. Nutrition, 2 (1930), No. 4, pp. 415–417*).—Evidence noted in a preliminary report on the influence upon longevity of slight improvement in diets already adequate (E. S. R., 60, p. 787) has been extended, with even more conclusive results. The number of animals on diet A has been increased to 135 males and 196 females and on diet B to 124 males and 163 females. The average increase in duration of life of the males on diet B over those on diet A was 64±11.7 days and of the females 66±11.2 days. "Hence it may be regarded as established beyond any reasonable doubt that, starting with a diet which is already clearly adequate, it may still be possible to induce a very significant improvement in longevity by enriching the diet in certain of its chemical factors."

The basal metabolism and vital capacity of Syrian women, E. L. Turner and E. Aboushadid (*Amer. Jour. Physiol., 92 (1930), No. 1, pp. 189–195*).—Basal metabolism tests, performed with a Krogh metabolimeter, and vital capacity measurements are reported for 28 Syrian women and 7 American, English, or German women, all residents of Syria.

The vital capacities were found to be definitely lower in the Syrian women than in the controls. The pulse rates and blood pressure values were within normal range in both groups. Using the Aub-DuBois standards, the average basal metabolism of the entire number of Syrian women was −12.1 per cent and of the controls −6 per cent. Included in the Syrian group were 4 subjects of mixed parentage, the basal metabolism of all of whom more nearly approached that of the controls than of the Syrian women. Omitting these figures in computing the average, the value became −13.3 per cent. It is concluded that the Aub and DuBois tables give values at least 12 per cent too high for Syrian women.

The growth and nitrogen metabolism of infants receiving undiluted milk, M. Van K. Nelson (*Amer. Jour. Diseases Children, 39 (1930), No. 4, pp. 701–710, figs. 6*).—Nine male infants were kept in a metabolism ward from the age of 2 weeks to from 6 to 10 months. Anthropometric measurements and röntgenograms of the bones were made each month and metabolism studies conducted at frequent intervals. Each infant received 660 cc. of undiluted milk daily at 2 weeks of age, with a gradual increase up to 900 or 1,000 cc. at 6 months of age. The raw milk was boiled vigorously for 3 minutes with 6 per cent of its volume of corn sirup. After cooling, from 4 to 5 cc. of lactic acid was added to each quart of milk. In addition to the milk mixture each infant also received daily 30 cc. of orange juice until 3 months of age and 60 cc. thereafter and ½ teaspoonful of cod-liver oil until 6 weeks of age and then 1 teaspoonful daily. Egg yolk was added to the feeding mixture, beginning at from 3 to 6 months, vegetables at 6 months, and fruit sauces at 7 months.

The diets were well tolerated and produced an increased rate of growth, both in weight and in length, as compared with the average for each age obtained by the Iowa Child Welfare Research Station.

"This study would confirm previous clinical observations that feedings of undiluted milk are well tolerated, and would indicate that the increase in weight is a desirable one and not merely the acquisition of adipose tissue."

Influence of feeding on certain acids in feces of infants.—IV, The effect of an excess of lactose in breast milk and in whole cow's milk on the excretion of volatile acids and of lactic acid, J. R. GERSTLEY, C. C. WANG, and A. A. WOOD (*Amer. Jour. Diseases Children, 39 (1930), No. 4, pp. 729–735, figs. 3*).—Continuing the investigation noted previously (E. S. R., 63, p. 290), the authors have compared the effect of lactose in amounts of from 3 to 12 per cent as supplements to breast milk and to whole cow's milk, the comparison in all respects being similar to the earlier one in which modified cow's milk was used (E. S. R., 60, p. 192).

The addition of 3 per cent of lactose to whole cow's milk caused an increase in the output of volatile acid and of lactic acid and in the total titrable acidity. It had very little effect on the weight of the stools, but increased their acidity to a marked degree. The addition of 12 per cent of lactose shifted the output of volatile acid toward that of untreated cow's milk and of lactic acid and total titrable acids toward breast milk. It produced great changes in the stools, often reducing their weight to approximately that of the stools from infants fed on breast milk, but a smaller change in acidity than did the 3 per cent addition. In no case did the addition of lactose result in as great changes in acidity as occur when the diet is changed from breast milk to whole cow's milk.

Minimum requirement of calcium and phosphorus in children, C. C. WANG, R. KERN, and M. KAUCHER (*Amer. Jour. Diseases Children, 39 (1930), No. 4, pp. 768–773*).—In connection with the previously noted investigation of the basal metabolism of undernourished children (E. S. R., 60, p. 91), data have been assembled on the calcium and phosphorus metabolism of 18 children with a calcium intake of from 0.013 to 0.145 gm. of calcium oxide and a phosphorus intake of from 0.043 to 0.204 gm. of phosphorus pentoxide per kilogram of body weight. Positive balances were obtained in every case when the calcium intake was above 0.032 gm. of calcium oxide and the phosphorus intake above 0.079 gm. of phosphorus pentoxide. The calcium retention varied from 0.004 to 0.025 gm. of calcium oxide and the phosphorus retention from 0.006 to 0.045 gm. of phosphorus pentoxide per kilogram of body weight. An increase in the calcium of the food resulted in an increase in the fecal calcium but no change in urinary calcium, while an increase in the phosphorus intake resulted in an increase in both urinary and fecal phosphorus.

"Based on our observations, the minimum and not the optimum calcium and phosphorus requirements of an 8-year-old child weighing 20 kg. and living on a mixed diet would be 0.64 gm. of calcium oxide and 1.58 gm. of phosphorus pentoxide per day."

The insensible perspiration in infancy and in childhood.—II, Proposed basal standards for infants, S. Z. LEVINE, M. KELLY, and J. R. WILSON (*Amer. Jour. Diseases Children, 39 (1930), No. 5, pp. 917–929, figs. 5*).—Using the methods described in the first paper of the series (E. S. R., 62, p. 92), determinations were made of the basal insensible perspiration of 110 infants in varying stages of nutrition and ranging in age from 9 days to 25 months. From statistical analysis of the data thus obtained, tentative standards and normal limits of variation have been calculated on the basis of age, weight, height, and surface area.

The insensible perspiration in infancy and in childhood.—III, Basal metabolism and basal insensible perspiration of the normal infant: A statistical study of reliability and of correlation, S. Z. LEVINE and E. MARPLES (*Amer. Jour. Diseases Children, 40 (1930), No. 2, pp. 269–284, figs. 6*).—This consists of a statistical study of published data of Benedict and Talbot on basal metabolism (E. S. R., 45, p. 561) and of Levine, Kelly, and Wilson noted above and a similar study of the correlation between metabolism and insensible perspiration in simultaneous or in independent measurements.

"The results verify by statistical methods the validity of the tentative standards recently proposed for the basal insensible perspiration of normal infants, and indicate that they compare favorably in reliability with the generally accepted standards for the basal metabolism of these subjects. The evidence, statistical and experimental, also establishes a high positive correlation between the physiologic mechanisms of heat production and insensible perspiration in the human subject, whether measured simultaneously in the respiration chamber or independently with the balance and respiration chamber. Evidence of correlation between the two variables in independent measurements is thus far limited to infants and adults."

The method of Benedict and Root[1] for predicting basal metabolism of adults from their insensible perspiration was also tested on infants with satisfactory results in the small number of infants thus far studied.

Malnutrition: A study of preventorium treatment and of end-results, J. R. WISEMAN (*Amer. Jour. Diseases Children, 39 (1930), No. 4, pp. 758–767, figs. 3*).—This is a general discussion, based chiefly upon the author's experience in a preventorium for undernourished children of Syracuse, N. Y. The customary rapid gains in weight of the children under such treatment were reported, with the statement that a majority of the children reach a normal state of nutrition in approximately 6 months. A follow-up study, however, of 100 children who had remained at the preventorium for from 3 months to 1 year showed that of the 92 who had left the camp with normal weight only 67 could be so classed from 1 to 3 years later. This is thought to indicate the need for intensive follow-up work for permanent results.

Reports from various sources are cited as showing the growing tendency to pay more attention in the public schools to general improvement in hygiene, particularly with regard to rest, feeding, and open-window ventilation, and to reserve the more expensive preventorium care for those children who have failed to benefit by a proper regimen in the schools.

Underweight children: Increased growth secured through the use of wheat germ, A. F. MORGAN and M. M. BARRY (*Amer. Jour. Diseases Children, 39 (1930), No. 5, pp. 935–947, figs. 2*).—In order to determine the effect of an increase in the vitamin B (F) content of the diet of underweight children on growth rate, two groups, including from 31 to 47 underweight school children from 11 to 13 years of age, were compared as to growth in weight, height, and certain other physical measurements over three periods totaling 30 weeks, beginning in October. In each period every child in one of the groups was required to include in the noon meal 3 oz. (85 gm.) of rolls made with 50 per cent wheat germ and 50 per cent white flour, while in the control group every child ate the same amount of rolls made with white flour. In the third period the groups were reversed, those eating the white flour rolls in the first period now receiving the wheat germ rolls.

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[1] Arch. Int. Med., 38 (1926), No. 1, pp. 1–35, figs. 3.

In each of the periods the weight increases of the group receiving the wheat germ rolls were about three times as great as in the control group, and in two of the wheat germ periods the height increases were also significantly greater. The alveolar CO_2 tension was increased in a larger percentage of the children eating the wheat germ rolls than of those in the control group.

In discussing this demonstration of the effectiveness of increasing the vitamin B content of the ordinary diet, the authors express the opinion that the diet is likely to be more deficient in vitamin B than in G, and that "the inclusion of a considerable proportion of clean bran-free sterilized wheat germ in bread, rolls, muffins, crackers, waffles, doughnuts, fruit cakes, and indeed all bakery and flour products is much to be desired, particularly in the diets in institutions, hospitals, schools, and homes with children. Similar use of rice polishings may prove desirable."

The vitamins of cereals (*Jour. Amer. Med. Assoc., 95 (1930), No. 4, pp. 268, 269*).—In this editorial on the report of Morgan and Barry noted above, attention is called to the statement of Taylor in his discussion of the place of wheat in the diet (E. S. R., 61, p. 386) that if it were desirable on economic or other grounds to have the vitamin of the germ, specifically vitamin B, retained in the bread it would be far better to have the baker add it artificially than to have the miller keep it in naturally. The studies by Morgan and Barry would seem to confirm this, since the amount of wheat germ in the rolls fed was much larger than the relatively small proportion found in whole wheat. "Perhaps, after all, the cereals have a contribution to make to the American dietary in ways that have not been completely or correctly evaluated in the past."

A study of the vitamin B complex of red kidney beans and polished rice, J. H. AXTMAYER (*Jour. Nutrition, 2 (1930), No. 4, pp. 353–357, fig. 1*).—The technic of Sherman and Axtmayer (E. S. R., 58, p. 295) has been applied in determining whether vitamin B (B_1) or G (B_2) is the limiting factor in the mixture of polished rice and red kidney beans which makes up a large part of the diet of the people of Porto Rico. Polished rice was found to be deficient in both vitamins B and G and the red kidney beans in G. Consequently a mixture of rice and kidney beans is still deficient in vitamin G.

Experimental nutritional polyneuritis in the rat, M. R. SANDELS (*Jour. Nutrition, 2 (1930), No. 4, pp. 409–413*).—During the course of the investigation noted previously (E. S. R., 61, p. 593), observations were made of the behavior of rats on diets deficient in vitamin B_1 and of the response to graded additions of this vitamin. These observations indicated that on diets absolutely devoid of B_1 the typical symptoms of polyneuritis seldom appear, but that animals receiving the vitamin in measurable but insufficient amounts develop these symptoms almost invariably. The resemblance is noted between these symptoms and those described by Hofmeister (E. S. R., 47, p. 769) as the subacute type of polyneuritis.

Studies in the physiology of vitamins.—XIII, The relation of gastric motility to anhydremia in vitamin B-deficient dogs, W. B. ROSE, C. J. STUCKY, and G. R. COWGILL (*Amer. Jour. Physiol., 92 (1930), No. 1, pp. 83–91, figs. 4*).—Profound disturbances in the motor function of the stomach in vitamin B-deficient dogs, as reported in the tenth paper of this series (E. S. R., 63, p. 394), and the occurrence of anhydremia in such animals, as noted in the seventh paper (E. S. R., 63, p. 93), led to a study of a possible relationship between disturbances in gastric motility and anhydremia. The paired method was followed, four dogs being fed the vitamin B-deficient ration and carefully matched controls the same amount of food and water per kilogram body weight plus the full requirement of vitamin B.

In each case disturbances in gastric motility during the course of B deficiency were associated either with a definite increase in hemoglobin and total blood solids or a marked reduction in these constituents soon after vitamin B therapy was instituted. The tendency to anhydremia, whether occurring in a vitamin B-deficient animal or its control, ran more or less parallel with a decrease in gastric hunger contractions.

To test further the hypothesis of a relationship between anhydremia and disturbances in gastric motility, normal dogs were deprived of water for six days and determinations made of the gastric motility. Complete gastric atony resulted and was cured by the administration of fluids.

It is concluded that an increase in blood concentration resulting either from restricted water intake or vitamin B deficiency lowers the motor activity of the stomach.

Studies in the nutrition of the white mouse.—VI, The experimental production of xerophthalmia in mice, E. POMERENE and H. H. BEARD (*Amer. Jour. Physiol., 92 (1930), No. 1, pp. 282–286*).—In this continuation of the series of papers noted previously (E. S. R., 63, p. 94) a further study of the experimental production of xerophthalmia in mice is reported, with the conclusion that the previous failure to obtain xerophthalmia was due to the presence of small amounts of vitamin A in the Crisco used in the basal diet. The authors are now of the opinion that mice do require vitamin A, but in much smaller amounts than do rats.

Studies in experimental scurvy.—VII, The effect of a vitamin C given parenterally to guinea pigs fed on a vitamin free diet, T. NAGAYAMA and T. TAGAYA (*Jour. Biochem., 11 (1930), No. 3, pp. 445–460, figs. 5*).—A concentrate of vitamin C was prepared from radish juice by adding 95 per cent alcohol to an equal volume of the pressed juice, filtering, and distilling the filtrate under diminished pressure in an atmosphere of nitrogen to one-fourth the original volume. The clear juice as thus prepared is said to have a strong acid reaction and sweet taste. The original radish juice prevented scurvy in a 300- to 500-gm. guinea pig in doses as small as from 3 to 5 cc. and the concentrate in doses of 0.5 to 1.25 cc. Corresponding amounts of the concentrate injected parenterally prevented scurvy, although causing necrotic ulcers at the point of injection.

Blood regeneration in severe anemia, XVI–XX (*Amer. Jour. Physiol., 92 (1930), No. 2, pp. 362–413*).—In continuation of the investigation noted previously (E. S. R., 61, p. 393), five papers are presented.

XVI. *Optimum iron therapy and salt effect,* G. H. Whipple and F. S. Robscheit-Robbins (pp. 362–377).—In this paper some of the earlier studies of the series are reviewed briefly in order to correct misinterpretations which have appeared occasionally in the literature. Certain points in technic are also discussed in considerable detail. The experimental observations reported and discussed include selected data on the reaction to iron in various forms, alone and combined with other salts.

These findings are thought to indicate an optimum dosage of iron by mouth for the experimental dogs of about 40 mg. daily. Above this level of intake a large excess of iron salts gives rise to no further production of hemoglobin. Similar results were obtained whether the iron was given in the form of ferric chloride, ferric citrate, ferrous carbonate, ferrous sulfate, or ferrous ammonium sulfate. On the optimum intake of any of the salts the weekly output of hemoglobin was about 25 gm. Since the basal ration contained 20 mg. of iron per

300 gm. of bread, the optimum total intake was at least three times as great as the loss of iron by bleeding and wastage of the red cells.

XVII. *Influence of manganese, zinc, copper, aluminum, iodine, and phosphates*, F. S. Robscheit-Robbins and G. H. Whipple (pp. 378–387).—Data are reported on the effect upon hemoglobin regeneration in dogs of various mixtures of copper, manganese, and zinc, with and without iron. Manganese, which is toxic to anemic dogs and has to be used with care, brought about very irregular response, sometimes favorable and sometimes not. It is thought to be somewhat less potent than copper salts. Zinc and antimony were practically inert and aluminum absolutely without effect. Potassium and calcium phosphates were almost without effect, and sodium iodide at times appeared to inhibit somewhat the salt effect of iron or copper.

XVIII. *Influence of liver and blood sausage, veal, eggs, chicken, and gelatin*, G. H. Whipple and F. S. Robscheit-Robbins (pp. 388–399).—Previous studies of the effect of various meat products on hemoglobin regeneration have been extended to the products listed in the title, with the following results:

Liver sausage showed a moderately high potency, depending upon the amount of liver contained in the sausage. Similarly blood sausage was quite potent, depending upon the proportions of the ingredients. It is thought that the contained blood was responsible for almost half the total effect, which occasionally amounted to about half that of whole liver. "Liver and blood sausage deserve careful study as to their applicability in various human anemias. As accessory diet factors they may prove to be quite valuable."

Calf skeletal muscle (veal) was as potent as any skeletal muscle thus far tested, being in the class with beef heart and about one-fourth as active as liver. Chicken skeletal muscle (white or dark) was slightly less potent than calf muscle, and chicken bones and skin still less potent. Egg yolk and egg white were relatively inert. Gelatin in large amounts had a slight effect, corresponding closely to the effect of beef muscle.

XIX. *Influence of spinach, cabbage, onions, and orange juice*, F. S. Robscheit-Robbins and G. H. Whipple (pp. 400–407).—Spinach and cabbage (red or white) had only a moderate effect on hemoglobin regeneration, from 10 to 12 gm. per week representing the regular effect of these vegetables. Iron added to the spinach ration produced an effect equal to the sum of the two materials alone. Onions and orange juice were almost inert.

XX. *Conservation of sheep and goose hemoglobin given intravenously to form dog hemoglobin*, G. B. Taylor, E. J. Manwell, F. S. Robscheit-Robbins, and G. H. Whipple (pp. 408–413).—Supplementing the study of the effect of dog hemoglobin injected intravenously, the authors have tested goose and sheep hemoglobin with similar favorable results except for a slightly delayed action. It is thought that part of the dog hemoglobin may be utilized direct by the marrow cells, but that in general any hemoglobin given intravenously is broken down before being utilized in the body.

Studies on the nutritive value of milk.—IV, The supplementary value of yeast in nutritional anemia of albino rats, W. E. Krauss (*Jour. Dairy Sci., 13 (1930), No. 3, pp. 246–256, figs. 6*).—During the course of the series of studies noted previously (E. S. R., 62, p. 583), it was found that different yeasts varied in antianemic potency and also in their content of copper and iron. This led to a systematic examination of 10 samples of yeast from six different manufacturers. All of the samples were dried, pulverized, analyzed for dry matter, total nitrogen, ash, copper, and iron, and tested as prophylactic and curative agents for anemia in rats in the usual way.

With two exceptions the yeasts showed antianemic potency but in varying degree. In general they were more effective in prophylactic than in curative tests. There appeared to be no correlation between the iron, but some correlation between the copper content and antianemic potency. That the hemoglobin regenerative power of certain yeasts is entirely unrelated to their vitamin B content is thought to have been demonstrated by the observation of Sure, Kik, and Walker of no association between vitamin B and anemia (E. S. R., 62, p. 297). The favorable effect on growth is attributed, however, to the vitamin B content. It is suggested that the favorable results reported by Hoobler (E. S. R., 60, p. 195) for yeast feeding to infants may have been due not only to additional vitamin B but to an increased intake of copper and iron.

The treatment of pernicious anemia with dried hog stomach [trans. title], G. Rosenow (*Klin. Wchnschr., 9 (1930), No. 14, pp. 652, 653, figs. 2*).—Following the appearance of the reports of Sturgis and Isaacs and of Sharp on the use of desiccated hog stomach in the treatment of pernicious anemia (E. S. R., 62, p. 398), the author has used it with equally successful results in the treatment of two cases of pernicious anemia, while in four cases of anemia of other types the material was without effect.

TEXTILES AND CLOTHING

Textiles and clothing: Selected list of periodicals reporting research, R. O'Brien and O. Hartley (*U. S. Dept. Agr., Bur. Home Econ., Home Econ. Bibliog. 6 (1930), pp. 11*).—This annotated bibliography of 65 titles of periodicals reporting research in textiles and clothing is classified under the headings general, art and design, chemical research on textiles, physical research on textiles, physiological aspects of clothing, psychological aspects of clothing, economics, and textile legislation.

MISCELLANEOUS

Experiment station progress: Report for the biennium July 1, 1927, to June 30, 1929, P. F. Trowbridge et al. (*North Dakota Sta. Bul. 233 (1930), pp. 134, figs. 50*).—This contains the organization list, a report of the director and heads of departments on the work of the station and the various substations and a financial statement for the biennium ended June 30, 1929. The experimental work reported is for the most part abstracted elsewhere in this issue. Meteorological data are also included.

Hettinger Substation Report for 1929, C. H. Plath (*North Dakota Sta. Bul. 234 (1930), pp. 25*).—The experimental work reported is for the most part abstracted in this issue. Meteorological data are also included.

Williston Substation Report, April 1, 1929, to March 31, 1930, E. G. Schollander (*North Dakota Sta. Bul. 235 (1930), pp. 43, figs. 21*).—The experimental work recorded is for the most part abstracted elsewhere in this issue. Meteorological data for 1929 are also included.

[Annual reports of county experiment farms, 1927–1929] (*Ohio Sta., Co. Expt. Farms Rpts. 1927, pp. [36]; 1928, pp. [36]; 1929, pp. [36]*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

The Bimonthly Bulletin, Ohio Agricultural Experiment Station, [September–October, 1930] (*Ohio Sta. Bimo. Bul. 146 (1930), pp. 129–175, figs. 12*).—In addition to several articles noted elsewhere in this issue, this number contains Getting Winter Eggs from Hens, by D. C. Kennard and V. D. Chamberlin (pp. 145–152), and Ohio Farms Owned by Life Insurance Companies, by F. L. Morison (p. 172), previously noted (E. S. R., 63, pp. 563, 782).

NOTES

Florida Station.—A tract of 620 acres, of which 70 acres is cleared and under fence, has been purchased for the enlargement of the work of the substation at Quincy. It is planned to start in the near future studies of the chemical factors which influence the character of cigar wrapper leaf tobacco, such as soils, fertilizers, the stage of maturity, and curing processes. A number of the less commonly used elements, such as copper, iron, manganese, and boron are to be tested in this connection. Work will also be taken up with other crops than tobacco, horticulture, and livestock.

Purdue University and Station.—A large addition to the sheep and cattle barn has been completed at the livestock experiment farm. A rather extensive drainage system is being installed at the horticultural experiment farm.

Dr. E. B. Mains, who has been in charge of the cereal leaf rust investigation, has resigned to accept a position at the University of Michigan and was succeeded September 1 by Dr. Ralph M. Caldwell as associate in botany. C. J. Borum has been appointed assistant agricultural statistician at the South Dakota College and has been succeeded by C. D. Balmer. Gail M. Redfield has been appointed research assistant in home economics.

Louisiana University.—President Thomas W. Atkinson, associated with the university in various capacities for 42 years, has resigned because of ill health. Dr. James Monroe Smith, dean of the College of Education of the Southwestern Louisiana Institute, has been appointed to succeed him.

Massachusetts College and Station.—What has formerly functioned more or less independently as a service unit in the institution under the name of the market garden field station at Waltham has been made a branch of the main station and will be known as the Waltham Field Station. As a result of this reorganization Ray M. Koon, formerly extension specialist in vegetable gardening, will be in charge, and responsible to the station director under the title of research professor of vegetable gardening. The change was made to promote more logical and satisfactory administrative relationships and closer cooperation in research, to which practically the entire program at the branch station is rapidly being devoted.

The new horticultural manufacturers building is now fully equipped, thereby making possible the centralization of the investigational work in this department and providing facilities for carrying on an extensive program in this field.

Leave of absence has been granted President R. W. Thatcher and Dr. A. B. Beaumont, head of the department of agronomy, for a period of six months and to Ralph A. Van Meter, professor of pomology, for one year.

Michigan College and Station.—A new animal disease research laboratory building is under construction at a cost of approximately $100,000. This is to be a three-story building about 55 by 70 ft. in size, of red brick and Gothic type. There has recently been completed a group of barns for the animal husbandry department at a total cost of approximately $96,000, of which one $15,000 unit is to be used exclusively for experimental work, a $9,000 experimental barn for the dairy husbandry section, and a greenhouse for research in plant pathology and plant physiology at a cost of approximately $20,000.

Recent appointments include Marion S. Hillhouse as instructor in home economics; Amy L. Newberg, instructor in nutrition; Jeannette K. Smith, assistant professor of home economics; R. S. Hudson, associate professor of animal husbandry; C. F. Huffman, assistant professor and research associate in dairying; D. L. Clanahan, extension specialist in farm crops vice B. D. Kuhn, resigned; and C. R. Dorman and A. L. Grizzard, research assistants in soils.

New Jersey Stations.—Funds appropriated by the State legislature last April have enabled the stations to carry on considerable new construction. This has included $10,000 for an addition to the plant physiology building comprising a laboratory and two offices, $5,000 for a third section of the short course greenhouses, 25 by 75 ft., $4,000 for a machinery shed and $3,000 for a horse barn at the horticultural farm, $6,000 for remodeling the heating system of the administration building, and $1,200 for installing an automatic refrigerating unit for the ice cream laboratory.

New York State Station.—Dr. D. C. Carpenter, chief in research (chemistry), has been appointed head of the division of chemistry, with Leon R. Streeter as chief in research, Dr. Z. I. Kertesz, associate in research, and Dr. J. J. Kucera, assistant in research.

South Dakota College and Station.—Sherman E. Johnson has been appointed head of the department of farm economics vice Murray R. Benedict, resigned.

Virginia Station.—Recent appointments include Dr. E. P. Johnson as assistant animal pathologist vice Dr. R. A. Runnells, resigned; R. A. Polson, as acting assistant rural sociologist, vice C. H. Hamilton, who is on leave of absence for graduate study during 1930–31; and A. D. Pratt, assistant professor of dairy husbandry and assistant in animal nutrition in the Connecticut College and Storrs Station, as assistant dairy husbandman.

Duke University Forestry School.—As a first step in the establishment of a forestry school at Duke University, Dr. C. F. Korstian, senior silviculturist at the Appalachian Forest Experiment Station of the U. S. Forest Service, has been appointed professor of silviculture and director of the Duke University Forest.

Complete plans for the school are to be deferred until after plans for the university forest have been developed and further study has been made of the need for additional forestry training in the South and the opportunities available for specialized forestry education. Tentative plans provide for a survey, inventory, and preliminary management plan for the university forest, which consists of approximately 5,100 acres adjoining the university campus at Durham, N. C. This forest lies in the lower Piedmont region and consists of second growth shortleaf and loblolly pines and hardwoods. Because of the representative nature of this tract and its size and location it is expected to serve well as a research and demonstration forest. A research program will be developed, taking advantage of opportunities to cooperate with other departments of the university and with other agencies in the region.

Merchants' Agricultural Research Fund of Western Australia.—A fund of nearly $60,000 has been raised by a group of about 130 merchants and other business men of Western Australia for the "perpetual endowment of the research work at or connected with the Muresk Agricultural College." A suitably engraved tablet commemorating this endowment was unveiled at the college at the recent commencement. It is expected that the first investigation to be undertaken will deal with pasture improvement and management.

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